1997 Alternative Study Report

From 1995 to 1997, the NCDOT conducted a study of potential alternatives for bypassing the Town of Blowing Rock. Included here is the final report of that study, which was published in August 1997. The report describes the project's purpose and need, the general characteristics of the project's setting, traffic study findings, potential bypass alternatives, and the pros and cons of those alternatives. This report proposes that four bypass alternatives and the widening alternative be evaluated in detail in a Draft Environmental Impact Statement. The study's citizen and agency involvement program is also described. Since this report was published, new traffic forecasts were prepared that took into account a 1998 origin and destination study, and the statement of purpose and need was revised. This revised purpose and need statement is included on this World Wide Web site. Project costs for the widening alternative and four bypass alternatives were also revised based on geotechnical studies conducted by the NCDOT in 1998. The revised costs were included on a March 1999 video presentation, which is also included on this web site. Finally, in 1999 the NCDOT decided to drop two of the four recommended bypass alternatives from further consideration.

US 321 Improvements EIS Study

Bypass Alternatives Analysis
T.I.P. No. R-2237C
State Project No. 6.73900IT
Federal Aid Project No. NHF-321 (1)
Caldwell and Watauga Counties, North Carolina

Prepared for

North Carolina
Department of Transportation
Planning and Environmental Branch
Raleigh, North Carolina

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Alternatives Study Report

Blowing Rock Bypass Alternatives

1. INTRODUCTION AND SUMMARY

1.1 PROPOSED ACTION

The North Carolina Department of Transportation (NCDOT) proposes to improve US 321 to a multilane facility for a distance of approximately 7.0 kilometers (4.3 miles) in Caldwell and Watauga Counties. Both widening the existing road and Blowing Rock bypass alternatives are being considered. The project area for this bypass alternatives study extends as far south as 0.9 kilometer (0.6 mile) south of Falcon Crest Road (SR 1421) and as far north as the SR 1533 (Aho Road)/US 321 intersection in order to capture the full range of potential bypass corridors (see Figure 1).

1.2 PURPOSE OF STUDY

The US 321 EIS Study is being performed in three phases: I) bypass alternatives study, II) preparation of a Draft Environmental Impact Statement for public and agency review that compares the widening and bypass alternatives, and III) preparation of a Final Environmental Impact Statement that responds to public and agency comments and identifies a preferred alternative. This report documents the findings of Phase I. Its purpose is to document the:

- Project's purpose and need.
- Selection of bypass alternatives for detailed evaluation in an Environmental Impact Statement.

1.3 PROJECT AREA

The project area is shown in Figure 1 and consists of: US 321 on the west and southwest; the US 321/SR 1533 (Aho Road) intersection on the north; a line between a point approximately one kilometer south of Falcon Crest Road and a point on the Yadkin River approximately 1,000 meters due south of the Watauga/Caldwell County line on the southeast; and the Yadkin River, Horse Ridge, and Thunder Hill on the northeast. The project area was expanded in the middle of the study to include an area north of the Blue Ridge Parkway.

1.4 SUMMARY OF BYPASS ALTERNATIVES STUDY FINDINGS

1.4.1 Purpose and Need

Consistency with County and State Plans

The 1981 Thoroughfare Plan for Caldwell County states that US 321 should be widened from two to four lanes. The plan currently is being updated. The 1993 Thoroughfare Plan for Region D (Alleghany, Ashe, Avery, Mitchell, Watauga, Wilkes, and Yancy Counties) assumes that US 321 is widened as specified in the Transportation Improvement Program. The Watauga County component of the Region D plan was adopted by Watauga County.

In 1989, the North Carolina State legislature designated a network of US and NC highways as intrastate corridors. The Intrastate System was established to connect major population centers and provide safe, convenient travel for motorists. It is designed to support statewide growth and development objectives (NCDOT, August 1992). US 321 is a part of the North Carolina Intrastate System.

Improvement of Roadway Characteristics

Existing US 321 is substandard because of steep grades, sharp curves, and narrow pavement widths. A widening alternative and each of the bypass alternatives would be an improvement over these conditions. The further south a bypass begins, however, the more there is of US 321 that would remain unimproved. The closer the beginning of the bypass portion is to the southern town limits of Blowing Rock, the less there is of US 321 that would remain unimproved.

Highway Capacity and Level of Service

The existing highway system lacks the capacity to handle projected traffic in the year 2025. Either a four-lane road or a bypass will relieve forecast congestion on existing US 321. A bypass with a Blue Ridge Parkway crossing would be less effective at reducing traffic on existing US 321.

The segment of US 321 south of Blowing Rock currently is operating at an undesirable peak hour level of service E (defined in section 2.5.3). Traffic in Blowing Rock is operating at a desirable peak hour level of service C. Without improvements, the level of service will worsen and reach level of service F south of Blowing Rock and E and F in Blowing Rock by 2025.

Safety

Accident rates along the segment of US 321 in the project area are substantially higher than the average accident rates for similar roads in North Carolina. Improving the existing road would allow safe passing of slower moving vehicles, permit smoother flow of traffic, allow vehicles to enter and exit the roadway more easily, and reduce the chances of head-on and rear-end collisions. Traffic using a bypass would have these same benefits. Although the number of accidents could decrease on portions of US 321 that remain unimproved with the bypass alternatives because of fewer vehicles on existing US 321, accident rates (based on vehicle miles traveled) would remain unchanged..

1.4.2 Potential Bypass Alternatives

Engineering, traffic, and environmental considerations were used to evaluate initially ten potential bypass location corridors. All included a northern terminus at Opossum Hollow Road south of the Blue Ridge Parkway. At the urging of the Concerned Citizens of Blowing Rock and the Blowing Rock Town Council, four potential corridors that cross the Blue Ridge Parkway in a tunnel were added; three were proposed by the Concerned Citizens of Blowing Rock, and one was developed by the study team. Constraints primarily related to terrain resulted in tunnel lengths longer than proposed by the Concerned Citizens. The Concerned Citizens' preferred location for returning the bypass to US 321 south of the Parkway also was added and connected to the southern termini of the three Concerned Citizens' corridors. The corridors are shown in Figure 2. The initial 10 are A, B, C, D, AG, BG, CG, DG, E, and F. Those added later include CC-AI, CC-BI, CC-CI, and AJ, which cross under the Parkway in a tunnel, and CC-AH, CC-BH, and CC-CH.

All of the corridors south of Blowing Rock, except Alternatives E and F can be mixed and matched with any ending point on the north. Alternative F can be combined with the northern ending point associated with alternatives CC-AH, CC-BH, and CC-CH.

1.4.3 Alternatives Selected for Further Study and Comparison to the Widening Alternative

Alternatives E; a combination of F with the northern ending point used for alternatives CC-AH, CC-BH, and CC-CH (Alternative FH); CC-CH; CC-CI (includes a tunnel) will be studied in greater detail and compared to the widening alternative in the Draft Environmental Impact Statement. These corridors were chosen for the following reasons:

- Alternative E (will be referred to as Bypass Alternative 1 in the DEIS)
    - It is the shortest and least expensive bypass alternative .
    - It can be designed to avoid area historic resources.
    - It would have the least visual impact on the Blue Ridge Parkway.
    - It would have a minimal impact on the Blowing Rock Assembly Grounds when compared to the other alternatives ending south of the Blue Ridge Parkway.
- Alternative FH (will be referred to as Bypass Alternative 2 in the DEIS)
    - Like Alternative E, it can be designed to avoid area historic resources.
    - Its northern terminus is between the Blue Ridge Parkway and the northern-most residential subdivision in Blowing Rock, unlike E, which terminates at Opossum Hollow Road. The Blowing Rock Town Council and many members of the Citizens' Advisory Committee have stated their objections to a northern terminus at Opossum Hollow Road.
- Alternative CC-CH (will be referred to as Bypass Alternative 3 in the DEIS)
    - In the past, representatives from the Concerned Citizens of Blowing Rock have indicated that the best corridor for returning a bypass to US 321 south of the Parkway was one that remained as close to the Parkway as possible.
    - It bypasses the final curves on existing US 321 before Blowing Rock, an area where sharp curves (20 to 45 mph design speeds) and steep grades (6.6 to 7.6 percent) would remain with the widening alternative. This feature is also important to several citizen

representatives.

- Alternative CC-CI (tunnel; will be referred to as Bypass Alternative 4 in the DEIS)
  - It avoids the Town of Blowing Rock by ending north of the Parkway, a feature important to the Town Council of Blowing Rock and many members of the project's Citizens' Advisory Committee.
  - Like CC-CH, it bypasses the final curves on existing US 321 before Blowing Rock, an area where sharp curves and steep grades would remain with the widening alternative.

None of the alternatives selected for further study and comparison to the widening alternative performs well on all evaluation criteria: engineering, cost, traffic, and environmental (natural and social). Based on the information known to date, the NCDOT cannot conclude at this time that any of the bypass alternatives are reasonable alternatives. Each of the four selected for further evaluation offers a different set of trade-offs, particularly between social and natural resource impacts. They, in combination with the widening alternative, appear to be a set of alternatives that best represents the differing issues and concerns associated with the US 321 improvements project.

The NCDOT will not select an alternative for implementation until after the DEIS is completed and is reviewed by citizens and regulatory agencies. The alternative selected for implementation could be one of the four bypass alternatives listed above or the widening alternative.

2. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

2.1 PROJECT SETTING

2.1.1 Land Use and Character

The project area is in western North Carolina and encompasses the northern part of Caldwell County and the southern part of Watauga County, including the resort community of Blowing Rock (see Figure 1). Land use in the project area includes scattered rural residential development in Caldwell County and eastern Blowing Rock, as well as concentrated low-density residential, commercial, and recreational development in Blowing Rock both east and west of US 321. Within Blowing Rock, US 321 passes through the Green Park Historic district, which is listed in the National Register of Historic Places. US 321 passes adjacent to the Green Park Inn and the Blowing Rock Country Club, which are included in the historic district. Development along US 321 in the southern portion of Blowing Rock is primarily low-density residential, while the primary development along US 321 in the northern portion of Blowing Rock is commercial. Development in Blowing Rock off of US 321 is primarily single-family residential. The Blue Ridge Parkway is near the northern border of the project area. A church assembly grounds is adjacent to the Parkway. Between the Blue Ridge Parkway and Aho Road (the northern boundary of the project area), the small amount of development is primarily rural residential. Along US 321, between the Parkway and Aho Road, there are a few commercial establishments on the east side. At the intersection of US 321 and Aho Road, there is a mobile home park.

2.1.2 Area Growth

Caldwell County's population grew 4.4 percent (67,746 to 70,709) from 1980 to 1990; between 1990 and 2000, the County is expecting a 4.4 percent growth in population (70,709 to 73,813) (NCDEHR, State Center for Health and Environmental Statistics). The rate of growth within Caldwell County is slower than surrounding counties and the State of North Carolina.

Watauga County's population grew by 16.7 percent from 1980 to 1990 (31,666 to 36,952); a 10.2 percent increase in population is projected for the period 1990 to 2000 (36,952 to 40,726) (Watauga County Planning Department). The census population figures do not represent the seasonal/part-year residents. Blowing Rock's permanent population in 1990 was 1,248 (1990 US Census). The town's population rises to about 10,000 persons in the summer months, as estimated by Blowing Rock town staff.

2.1.3 Transportation Plans

The project is included as TIP No. R-2237C in the 1997-2003 update of the North Carolina Transportation Improvement Program (June 1996) covering the period from Federal Fiscal Year (FFY) 1997 to FFY 2003. Right-of-way acquisition and construction currently are not scheduled.

The following additional transportation improvement projects are near the project area:

R-2237A	Widen US 321 to a multi-lane road from NC 268 at Patterson to SR 1370 (Nelson Chapel Road) in Caldwell County.
R-2237B	Widen US 321 to a multi-lane road from SR 1370 (Nelson Chapel Road) to SR 1500 (Blackberry Road) in Caldwell County.
R-529	Widen US 421 to a multi-lane road from NC 194 in Boone to two miles east of US 221 in Watauga County (part under construction).
U-2202	Widen US 221 to a multi-lane road from US 221/321 to US 421/NC 194 in Boone.
R-2566	Widen NC 105 to a multi-lane road from US 221 in Avery County to SR 1107 in Boone (only planning and design scheduled).
U-2703	US 421 bypass south of Boone, part on new location (scheduled for environmental review only).
R-2615	Widen US 421 to a multi-lane road from US 221 in Boone to the Tennessee State Line (identified as a future need only).

2.2 PROJECT HISTORY

The improvement of most of US 321 to a multi-lane road is specified in the 1989 Highway Trust Fund Act for North Carolina. In 1993, an Environmental Assessment (EA) was prepared that recommended widening US 321 from NC 268 in Patterson to US 221 in Blowing Rock. A Finding of No Significant Impact (FONSI) was prepared for the southern 10.8 miles of the project area, from NC 268 to SR 1500 (Blackberry Road). At public hearings, representatives of government, businesses, Appalachian State University, and the public spoke in favor of a four-lane US 321 between Lenoir and Boone. In addition, many citizens from Blowing Rock and the State Historic Preservation Office strongly preferred a project that included a bypass around Blowing Rock. The FONSI therefore indicated that an Environmental Impact Statement would be prepared for the northern 4.3 miles of the EA's project area (from SR 1500 [Blackberry Road] to US 221 in Blowing Rock) that compared the widening alternative with a Blowing Rock bypass.

Widening US 321 to four lanes between NC 268 and SR 1500 will improve traffic flow and increase safety along that portion of US 321. The objectives of the state's intrastate corridor system also will be met for that portion of US 321. These benefits will be achieved independent of any improvements between SR 1500 and US 221.

2.3 SYSTEM LINKAGE

In the 1989 Highway Trust Fund Act, the North Carolina State legislature designated a network of US and state highways as intrastate corridors. The Intrastate System was established to connect major population centers and provide safe, convenient travel for motorists. It is designed to support statewide growth and development objectives. The intrastate system plan calls for the widening of existing two-lane sections to

multi-lane facilities. US 321 from the South Carolina border south of Gastonia to its junction with US 421 west of Boone, North Carolina is part of the intrastate system. This corridor is defined as the principal north-south route uniting the western Piedmont.

2.4 INTERMODAL TRANSPORTATION

AppalCart, the Boone bus system, operates a morning and an afternoon bus to Blowing Rock Monday through Friday. The bus makes two stops on US 321.

2.5 NEED FOR ACTION

The need for an improved US 321 is reflected in the following ways:

- The improvement is in the thoroughfare plans for both Caldwell and Watauga Counties.
- The existing road is substandard because of narrow pavement width, sharp curves and steep grades. The improvement of roadway characteristics that currently increase the potential for accidents would include the addition of through lanes and turning lanes, wider shoulders, and straightening of substandard curves.
- The segment of US 321 south of Blowing Rock currently is operating at level of service E (defined in section 2.5.3). Without improvements, the level of service will continue to worsen and reach level of service F south of Blowing Rock and E and F in Blowing Rock by 2025.
- Accident rates along the segment of US 321 in the project area are substantially higher than the average accident rates for similar roads in North Carolina. The proposed improvements would allow safe passing of slower moving vehicles, permit smoother flow of traffic, allow vehicles to enter and exit the roadway more easily, and reduce the chances of head-on and rear-end collisions.
- US 321 is a part of the North Carolina intrastate system. The system plan calls for the widening of all existing two-lane sections within this corridor to multi-lane facilities.

These plans and needs are described in detail in the following paragraphs.

2.5.1 Thoroughfare Plans

The 1981 Thoroughfare Plan prepared by the NCDOT for Caldwell County states that existing US 321 should be adequate through 2000, but, ultimately, the number of lanes should be increased from two to four. The Caldwell County Thoroughfare Plan currently is being updated. When identifying future road improvement needs, the 1993 Thoroughfare Plan for Region D (Alleghany, Ashe, Avery, Mitchell, Watauga, Wilkes, and Yancy Counties) assumes that US 321 is widened as specified in the Transportation Improvement Program. The Watauga County component of the Region D plan was adopted by Watauga County.

2.5.2 Existing Roadway Characteristics

US 321 is designated as a principal arterial in the statewide highway network and carries both local and through traffic. The segment of US 321 to be examined in the Draft Environmental Impact Statement includes up to 3.4 kilometers (2.1 miles) of rural highway south of Green Hill Road and 3.5 kilometers (2.2 miles) of urban arterial in the Town of Blowing Rock.

Roadway Characteristics and Posted Speeds

The roadway can be described best in three sections, each with common characteristics:

- The rural section south of Blowing Rock.
- The urban section between Green Hill Road and US 321 Business in Blowing Rock.
- The urban section between US 321 Business and US 221 in Blowing Rock.

The two-lane rural section south of Blowing Rock has a narrow 6.7-meter (22-foot) paved travelway with a one-foot paved shoulder on each side and a speed limit of 80 kilometers per hour (kph) [50 miles per hour (mph)]. The horizontal alignment is poor with numerous sharp curves up to 30 degrees (60-meter radius) [design speed approximately 40 kph (25 mph)]. In addition, the terrain is mountainous with steep grades between 6 and 8 percent occurring regularly.

The two-lane urban section of US 321 between Green Hill Road and US 321 Business (which passes through the Green Park Historic District) is approximately 1.3 kilometers (0.8 mile) long with a 7.3-meter (24-foot) pavement width and a narrow travelway varying between 6.1 and 6.7 meters (20 and 22 feet). The speed limit is 60 kph (35 mph). Grass shoulders are either non-existent or very narrow. The horizontal alignment is fair with a series of four reverse curves up to 24 degrees (70-meter radius) [design speed approximately 50 kph (30 mph)]. The terrain is rolling with a maximum grade of 3.5 percent.

The 2.3-kilometer (1.4-mile) urban section between US 321 Business and US 221 has two lanes with a pavement width varying between a narrow 6.1 meters and 11.0 meters (20 and 36 feet with the wider width occurring where there is a turn lane) and a speed limit of 60 kph (35 mph). The northernmost 0.16 kilometer (0.1 mile) of this section has four lanes. The alignment is generally straight on rolling terrain with a maximum grade of seven percent.

Passing opportunities along the entire project length are limited because of the terrain and sight distance restrictions.

Sidewalks, Bicycle Facilities and Pedestrian Movements

There are no sidewalks along the project, except for a single sidewalk in front of the Green Park Inn. A sidewalk is proposed in the *Boone/Blowing Rock Alternative Transportation Plan* (1997) for US 321 between its intersection with US 321 Business to US 221. Concentrations of pedestrian travel across US 321 occur at three points in Blowing Rock -- Green Hill Road area, Sunset Drive and Opossum Hollow Road. In the Green Hill Road area, pedestrians cross US 321 between the Green Park Inn and a parking

lot opposite the Inn. A pedestrian/bicycle path is proposed along US 321 from its intersection with US 221 to the southern town limits of Boone. In addition, bicycle routes are proposed for Opossum Hollow Road, Wonderland Drive, Goforth Road and Green Hill Road. The plan in which these improvements are proposed was adopted by the Boone Town Council in November 1995 and by the Blowing Rock Town Commission in September 1994. It was submitted to the NCDOT in 1996 for funding.

Intersections and Access Control

The US 221, Sunset Drive and Shoppes on the Parkway/Opossum Hollow Road intersections, all in Blowing Rock, are signalized. Traffic volumes on most intersecting roads are light. No restriction on access to abutting properties applies.

Drainage Structures

There are no major drainage structures along the project.

School Bus Use

Elementary and high school bus routes use or cross US 321. The buses frequently enter and exit US 321, but because of the arrangement of the route, the children do not need to cross US 321 to load or unload.

2.5.3 Highway Capacity

Traffic Volumes

Figure 3 and Table 1 show the average daily traffic (ADT) in May 1994 for each major link on US 321 and projected for 2025. The existing ADT in May ranged from 7,250 to 12,150 vehicles through Blowing Rock and was 6,550 vehicles south of the town limits. The existing May ADT figures are actual counts taken as a part of preparation of a new Boone thoroughfare plan. May was chosen for the counts by the NCDOT after consultation with local officials and represents an "average" month. The projected traffic volumes for the design year 2025 are based on local population and employment growth trends.

The 2025 May ADT would range between 12,450 and 24,900 vehicles through Blowing Rock, depending upon the location, and would be about 14,100 vehicles south of the town limits. The forecasts include nine percent daily truck traffic on US 321. Because non-truck traffic makes up a higher percentage of total traffic during peak hours, the peak hour truck percentages are assumed to be one-half of the daily percentage.

Level of Service

Level of service (LOS) is a qualitative measure that characterizes the operational conditions within a traffic stream and the perception of traffic service by motorists and passengers. The different levels of

service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels are used to measure level of service. They range from the letter A to F. For roadways, LOS A indicates no congestion and LOS F represents more traffic demand than road capacity and extreme delays.

Table 2 provides a general description of various level of service categories for roadways as given in the *1994 Highway Capacity Manual*, as well as descriptions for signalized and unsignalized intersections. Specific level of service definitions vary for two-lane highways, multi-lane highways and intersections. In addition, the level of service for signalized and unsignalized intersections cannot be compared directly. In general, a poor level of service rating still can be considered acceptable for an unsignalized intersection. This is because the unsignalized intersection analysis is based upon the availability of gaps in traffic for minor street traffic, which means an intersection can have a poor level of service despite no delays on the major street. The signalized intersection analysis provides an overall average delay and level of service for the entire intersection.

New or upgraded roads in rural areas in North Carolina typically are designed for LOS C in the design year. This policy is based on pages 89 to 92 of *A Policy on Geometric Design of Highways and Streets* (American Association of State Highway and Transportation Officials, 1990). For urban areas, LOS D is typically acceptable when it is too costly or environmentally damaging to design for a better level of service, but LOS C is preferred. The goal for the US 321 improvements is LOS C or better in 2025.

1994. Table 3 presents the peak-hour level of service for each road link. Table 4 summarizes the level of service for each intersection. US 321 currently operates at LOS E south of Blowing Rock. Since LOS E defines the capacity of the highway, it indicates high delays and little or no passing opportunities during peak periods. A primary reason for this condition is the mountainous terrain and resulting slow truck speeds. Through Blowing Rock, however, the level of service is at or better than LOS C in all locations. All signalized and unsignalized intersections currently operate at LOS C or better.

2025. Table 3 also includes level of service in 2025 for the No-Build Alternative. The road south of Blowing Rock would operate at LOS F in the peak periods. US 321 through Blowing Rock would operate at LOS E between Green Hill Road and US 321 Business. Between US 321 Business and US 221, US 321 would operate at LOS F. Traffic flow under these conditions would be extremely congested during peak periods.

The level of service at all existing signalized intersections on US 321 would deteriorate to conditions worse than LOS F as shown in Table 4. The level of service of the unsignalized intersections at Green Hill Road, US 321 Business, and the Food Lion entrance also would deteriorate to F. A planning level signal warrant analysis (using ADT and peak hour-based warrants and the *Institute of Transportation Engineers Manual of Traffic Signal Design, Second Edition*) indicated the need for traffic signals at these intersections by 2025.

2.5.4 Accidents/Safety

Accident data for the project area were assessed for the period between January 1, 1991 and December 31, 1994. Accident rates, categorized by fatal accidents, non-fatal injury accidents, property damage accidents, and total number of reported accidents, were compared to average rates for other roads with similar characteristics in North Carolina. Average crash rates for various roads in North Carolina are based on NCDOT data for the years 1992 through 1994.

The accident rates are accidents per 100 million vehicle-kilometers driven. Table 5 shows the accident rates for the existing roadway and the average rates for rural and urban two-lane roadways in North Carolina.

Rural Section

The rural section of US 321 in the project area starts at SR 1421 (Falcon Crest Road) and ends at the Watauga County line. It has a total length of 5.7 kilometers. As indicated in Table 5, the accident rate for the rural portion of the project area roadway (south of Blowing Rock) is substantially higher than the state average for a roadway with similar characteristics. Though there were no reported fatal accidents during the period, the total reported accident rate is 67 percent higher than the state average. The non-fatal accident rate is 78 percent higher than the state average, and the property damage accident rate is 61 percent higher than the state average.

The differences between Blowing Rock's three-year record of no fatalities and the statewide averages for the same period are not statistically significant. It takes far more than three years for 100 million kilometers of travel to occur on this segment of US 321 and the number of fatal accidents in North Carolina is far lower than other types of accidents. Thus, the focus of this study is on differences in total, non-fatal and property damage accidents.

The type of accidents on the rural section can be divided into broad categories. Over 40 percent of the accidents involved single vehicles running off the road. In addition, 20 percent of the accidents were the result of vehicles rear-ending a slower or stopped vehicle. The provision of extra lanes and standard shoulders could reduce these accidents significantly. Improvement of the sharp curves also could result in fewer vehicles running off the road. Locations with particularly high accident rates include some intersections and sharp curves through the rural mountain section.

While weather plays a factor in some accidents, no specific trends were noted in the accident analysis. Accidents increased in the winter months between December and February, presumably because of icy conditions. No data were available to measure the effect of fog on accidents.

Two sections of the existing rural section of US 321 were identified as high accident locations. Accidents at these locations typically reflected poor horizontal geometric conditions (sharp curves). In addition, one

high accident intersection was identified in the analysis. These locations are:

- Approximately 1.1 kilometer (0.7 mile) passing and reverse curve section south of SR 1500 (Blackberry Road) -- 27 total accidents, 31 injuries.
- Approximately 1.1 kilometer (0.7 mile) reverse curve section south of Blowing Rock Town Limits -- 19 total accidents, 24 injuries.
- SR 1500 (Blackberry Road) Intersection -- 7 total accidents, 12 injuries.

Urban Section

The existing accident rates in Blowing Rock (urban section) are presented and compared with North Carolina averages in Table 5. The total accident rate for the existing US 321 through Blowing Rock is 80 percent higher than similar urban US routes in North Carolina. The non-fatal injury accident rate is 112 percent higher than the state average, and the property damage accident rate is 60 percent higher than the state average.

Accident records indicate that almost all intersections on this section of US 321 are prone to a high number of accidents. A majority of these accidents involved vehicles rear-ending slow or stopped vehicles. In addition, between US 321 Business and US 221, accidents often were related to traffic entering/exiting driveways. No weather-related trends were observed in the urban section.

The analysis identified specific high accident locations. Of the six locations identified, five were intersections. The single roadway section identified includes a series of reverse curves (curve in one direction that is followed almost immediately by a curve in the opposite direction), as well as three closely spaced intersections with poor sight distance. The locations are:

- Green Hill Road (SR 1354)/Rock Road intersection -- 9 total accidents, 1 injury.
- Pinnacle Avenue, Country Club Road and Norwood Circle -- 12 total accidents, 7 injuries.
- US 321 Business intersection -- 13 total accidents, 8 injuries.
- Sunset Drive signalized intersection -- 13 total accidents, 7 injuries.
- US 221 signalized intersection -- 8 total accidents, 3 injuries.
- Shoppes on the Parkway signalized intersection -- 15 total accidents, 11 injuries.

2.5.5 Legislation

In 1989, the North Carolina State legislature designated a network of US and NC highways as intrastate corridors. The Intrastate System was established to connect major population centers and provide safe, convenient travel for motorists. It is designed to support statewide growth and development objectives (NCDOT, August 1992). US 321 is a part of the North Carolina Intrastate System.

2.6 PURPOSE OF ACTION

Based on the above description of needs, the purpose of the proposed project is to:

- Meet the objectives of county thoroughfare plans and the 1989 Highway Trust Fund Act.
- Improve future traffic flow.
- Reduce accidents.

3. AFFECTED ENVIRONMENT

This section describes the existing social, natural resource, historic resource, and visual characteristics within the project area. The descriptions of social and visual resources encompass both the project area south of the Parkway and that north of the Parkway. The natural resource and historic resource discussions only relate to the area south of the Parkway. The characteristics described are those relevant to the comparison of potential bypass alternatives presented later in this report. As a part of this analysis, a land suitability display was prepared to identify land uses and sensitive features within the project area south of the Parkway.

3.1 SOCIAL

This section describes the communities in the project area and their characteristics.

3.1.1 Caldwell County

The Caldwell County portion of the project area is in Patterson Township and consists primarily of the Blackberry Valley/Bailey Camp community area. The township is predominantly white (99 percent), with an elderly population of 13 percent and a low income population of 12 percent. These figures are slightly higher than those for the county as a whole (1990 Census of Population and Housing). The median household income for the township is $21,767 compared to $25,691 for Caldwell County.

Blackberry Valley/Bailey Camp Community Area

The Blackberry Valley/Bailey Camp communities are sparsely populated and rural, consisting largely of farms and forest. The area, approximately 2.4 kilometers (1.5 miles) south of Blowing Rock, is traversed by unpaved, narrow, winding roads with sections of steep grades. The two primary roads are Blackberry Road and Bolick Road. Most homes are in the valleys, although some are clustered on ridges. Community facilities include two churches, a school and a "country" store. Several cemeteries are in the area. Along US 321, one can find a few single-family homes and the Valley View Motel, which overlooks Blackberry Valley. Blackberry Ridge condominiums, a six-unit multi-family structure, is on the east side of US 321 north of this area.

Blowing Rock

The southern end of Blowing Rock is in Caldwell County and consists primarily of low-density, single-family units. This area includes the Green Park Inn.

3.1.2 Watauga County

The Watauga County portion of the project area consists primarily of the Town of Blowing Rock, a resort village that is home to a large seasonal and retirement population. The town is approximately 99 percent white, with an elderly population of 24 percent (compared to 97 percent and 11 percent, respectively, for Watauga County). According to town planners, the seasonal population is approximately 10,000, just over eight times the permanent population in 1990. Census figures indicate that 46 percent of the dwelling units in Blowing Rock are second homes. In 1990, the median income for Blowing Rock was $25,521 compared to $20,252 for Watauga County (1990 Census of Population and Housing).

Green Hill/Green Hill Road Area

This area consists primarily of single-family second homes. Many overlook the Blackberry Valley/Bailey Camp area. As one travels north on Green Hill Road and nears the Blue Ridge Parkway, development transitions into a more rural, farm community. New second home subdivisions are developing adjacent to Green Hill Road. The Blowing Rock Country Club golf course and a church are also in this area. The Five Points (A.L. Shuford) House, a National Register-eligible property, is on Green Hill Road.

The farming community near the north end of Green Hill Road includes the Craig farm. The Craig property is adjacent to the Blue Ridge Parkway on Green Hill Road and between the Blue Ridge Parkway and Blowing Rock Assembly Grounds. The property was split in 1935 when right-of-way was acquired for the Blue Ridge Parkway. The construction of Green Hill Road and Wonderland Drive further divided the original property. Descendants of the Craig family own individual homes in the area.

Wonderland Drive Area

This area lies between Green Hill and Goforth Roads. All of the homes along this winding, partially paved road are adjacent to the golf course. Much of the land along Wonderland Drive is undeveloped.

Blowing Rock Assembly Grounds Area

The Blowing Rock Assembly Grounds is a conference and retreat center sponsored by the United Church of Christ. Its entrance is on Goforth Road and the grounds extend to the Blue Ridge Parkway boundary. The Assembly Grounds was founded in the late 1940s. Most facilities are congregated in one area and include a lodge, dormitories, and gym. Six two-bedroom cottages are also on the property. Two miles of hiking trails and an open field used for recreation lie between the lodge and the Blue Ridge Parkway. The woods in this area are used for high school retreats with an ecology theme. A spring on the property is the source of the New River. The Assembly Grounds can house approximately 400 guests.

Homes, including second homes, lie along Goforth Road opposite the Assembly Grounds.

Opossum Hollow Road Area

This area extends from Sunset Drive to the US 321/Shoppes on the Parkway intersection. It contains a mixture of old and new homes and some commercial properties near the intersection with US 321. An electrical substation is also near this intersection. The First Independent Baptist Church, the former Blowing Rock Negro Community Church, is near Opossum Hollow Road. The entrance to the Hillwinds Estates subdivision is on Opossum Hollow Road.

Thunder Mountain Road/Aho Road Area

This area lies just north of the Parkway and includes a cluster of homes on Thunder Mountain Road and its environs and a mobile home park on Aho Road at its intersection with US 321. Near the Parkway, the area consists largely of farmland and forest.

3.1.3 Public Recreation Lands

The project area contains the Blue Ridge Parkway and Moses Cone Memorial Park.

3.1.4 Farmlands

The US Department of Agriculture, Natural Resource Conservation Service (formerly Soil Conservation Service) has identified three general categories of important farmland soils -- prime, unique, and statewide and local important. Prime, as well as statewide and local important farmland soils, are found in the project area. Prime farmlands consist of soils that are best suited for producing food, forage, fiber, and oilseed crops. Such soils have properties that are favorable for production of sustained high yields with minimal inputs of energy and resources. Farmland of statewide and local importance consists of soils that do not meet all of the requirements for prime farmland because of steepness of slope, permeability, susceptibility to erosion, low available water capacity, or some other soil property. Statewide and locally important farmland, however, is considered valuable in the production of crops when managed according to modern farming methods, including drainage to control excess water. Soils that have a special set of properties that are unique to producing certain high-value crops meet the requirements for unique farmland.

About 7 percent, or 8,376 hectares (20,686 acres), of Caldwell County meet the requirements for prime farmland. There is no statewide or locally important farmland in Caldwell County. About 2.5 percent, or 2,081 hectares (5,140 acres), meet the requirements for prime and statewide (but not locally) important in Watauga County.

3.1.5 Noise

Fundamental Concepts of Highway Noise

Environmental noise, intensity, or level is quantified in decibels (dB). The most commonly used measure of noise level is the A-weighted sound level (dBA). Scientists have found that the human ear is more sensitive to midrange frequencies than it is to either low or very high frequencies. At the same sound level, midrange frequencies therefore are heard as louder than low or very high frequencies. This characteristic of the human ear is taken into account in an A-weighted sound level.

The sound level from any roadway fluctuates from moment to moment as time passes. To take this into account, a common descriptor for environmental noise is L_{eq}. L_{eq} is defined as the continuous A-weighted sound level that in a given time period contains the same energy as the actual time varying sound during that period. L_{eq} has been shown to be a particularly stable descriptor for traffic noise assessment. L_{eq} typically is evaluated over a one-hour period. All noise levels determined in this study are one-hour L_{eq}.

Existing Noise Levels

A noise measurement survey was conducted in the project area on May 20 and 21, 1996 to document existing (i.e. ambient) noise levels. Sites selected were representative of noise sensitive receptors within the project area. Table 6 lists the locations where measurements were made and the measured L_{eq}. The measurements were taken prior to the decision to expand the project area to include the area north of the Parkway.

The locations were selected so that there were no or minimal buffers or barriers between the roadway and receptor.

Noise measurements were recorded for 10 to 20 minute periods. The noise meter used for this project was a Type-I Noise Level Analyzer B&K/2230. Accessories included a B&K 4230 calibrator, and B&K 1565 microphone and windshield. The microphone was placed five feet above the ground. Measured levels ranged from 41.0 dBA in the woods along an Assembly Grounds' trail and 41.8 dBA on Green Hill to 53.0 dBA at a home below the Valley View Motel (on US 321) and 53.4 dBA near a lunch stand on the Blowing Rock Country Club's golf course.

3.1.6 Hazardous Materials and Underground Storage Tanks

A field reconnaissance within the bypass corridors (including their widening segments) and a search of appropriate federal and state agency files were conducted to determine if there were any potential hazardous material spill sites or potential underground storage tank sites adjacent to any of the corridors south of the Parkway. The study was done prior to the decision to expand the project area to include the area north of the Parkway. No potential hazardous material spill sites were found. One potential underground storage tank site was found adjacent to US 321 at SR 1422 (Old US 321) north of Harrison Cemetery.

3.2 NATURAL RESOURCES

This discussion of natural resources was prepared prior to the decision to expand the project area to encompass the area north of the Parkway. That area is not expected to be substantially different from the following description.

3.2.1 Physical Resources

Topography

The project area is situated in the Mountain physiographic province and within the Grandfather Mountain Window geologic region. The area is underlain by lateral belts of Blowing Rock gneiss, biotite granitic gneiss, Linville metadiabase, and metisiltstone (Department of Natural Resources and Community Development [DNRCD], 1985).

Topographically, the project area can be separated into two regions. The southern and eastern portion of the project area consists of the flanks of the Blue Ridge Mountains and is characterized by steep, deeply dissected slopes. The northern and western portions of the project area, the Blowing Rock plateau, are above the Blue Ridge Flank where topography is much less severe. This region is characterized by hilly terrain with gentler slopes but steep areas along drainage ways. Elevations within the project area range from a low of approximately 756 m (2,480 feet) mean sea level (MSL) in Bailey Camp Creek to a high of approximately 1,170 m (3,840 feet) MSL near the Blowing Rock Assembly Grounds (USGS Boone and Globe topographic quadrangle maps).

Soils

Soils on the steep, deeply dissected slopes of the Blue Ridge Flank consist primarily of the Chestnut-Edneyville Association in Caldwell County (SCS 1989) and Stony rough land in Watauga County (SCS 1944). These soils typically occur on 15 to 80 percent slopes, are well-drained and formed in the residuum of metamorphic rock. Erosion is a severe hazard in areas where the surface is bare or has been disturbed. A variety of soil mapping units occurs in the area around Blowing Rock (above the Blue Ridge Flank), of which Ashe soils are most common. This soil typically occurs on 30 to 60 percent slopes, is well-drained and is formed in the residuum of granite, acidic gneiss and schist. Erosion is a moderate hazard in areas where the surface is bare or disturbed.

Water Resources

Creeks and tributaries below Blowing Rock, on the Blue Ridge Flank, are part of the Yadkin-Pee Dee River Basin (USGS Hydrologic Unit 03040101). Creeks and tributaries in the vicinity of Blowing Rock, above the Blue Ridge Flanks, are part of the New River Basin (USGS Hydrologic Unit 05050001).

The Yadkin-Pee Dee Basin streams drain the Blue Ridge Flank generally from northwest to southeast. Named streams within the Yadkin-Pee Dee River Basin portion of the project area include Martin Branch, Bailey Camp Creek, Ooten Creek, and Jackson Camp Creek (shown in Figure 4). All of these streams have been assigned a best usage classification of C Tr. Class C uses include aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. Secondary recreation involves human body contact with water on an infrequent or incidental basis. Tr is a supplemental classification designating waters suitable for natural trout propagation and maintenance of stocked trout (NC DEM, 1993).

Middle Fork of the South Fork of the New River is the only named stream within the New River Basin portion of the project area. This stream has been assigned a best usage classification of WS-IV +. Class WS IV waters are protected as water supplies that are generally in moderately to highly developed watersheds. Discharge of treated water is granted under permits and local programs to control non-point source and stormwater discharge of pollution are required. These waters are also suitable for all Class C uses. The "+" designation indicates that these waters are subject to a special management strategy concerning stormwater controls and water quality standards in order to protect downstream waters designated as an Outstanding Resource Water (ORW). The New River is considered an ORW because of portions of it are designated as wild and scenic, although not the portion in the project area. This federal designation seeks to keep such waters free-flowing by prohibiting dams and other obstructions.

3.2.2 Biotic Resources

Plant Communities

The project area is mostly forested because of its rugged terrain and inaccessibility. Existing US 321 is the only paved road that traverses the Blue Ridge Flank in the vicinity of the project area. The few unpaved roads either follow ridge lines or streams. Only small areas adjacent to these roads have been cleared for residential dwellings, usually accompanied by agricultural and pastoral plots. Also associated with residential areas are orchards and Christmas tree plantations. Within the project area, four broad classifications of plant communities were identified: one natural community, cove forest; and three variations of disturbed land: pastoral/agricultural land, plantation/orchard and residential/disturbed land.

Cove Forest. The cove forest is a diverse community, documented by Schafale and Weakley (1990), that supports a mixture of hardwoods and conifers in the canopy. The canopy is typically characterized by eastern hemlock (*Tsuga canadensis*), northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), sweet pignut hickory (*Carya glabra*), fraser magnolia (*Magnolia fraseri*), and rock chestnut oak (*Quercus montana*). The cove forest has a relatively open subcanopy including saplings of canopy species, witch hazel (*Hamamelis virginiana*), hop hornbeam (*Ostrya virginiana*), cherry birch (*Betula lutea*), and sourwood (*Oxydendrum arboreum*). This community can be separated into two subtypes based on orientation: the rich cove forest and the acidic cove forest. The rich cove forest is primarily found on south-facing slopes, which receive more sunlight and, therefore, are warmer and drier than north-facing slopes. Acidic cove forests occur on north-facing

slopes, which are typically shady, cooler and moister. The rich cove forest supports a variety of shrubs and herbs, while the acidic cove forest is dominated by ericaceous shrubs such as rosebay rhododendron (*Rhododendron maxim*) and mountain laurel (*Kalmia latifolia*).

In some areas, the cove forest displays signs of past logging. These areas were left with sufficient cull trees and are succeeding rapidly to steady-state conditions. Therefore, these successional areas were included in this community description.

Pastoral/Agricultural Land. Most of this community comprises cow and horse pastures adjacent to residential dwellings. Scattered trees include red maple and black locust (*Robinia pseudoacacia*). These areas support a variety of herbs and grasses. Agricultural plots are small, and principle crops include corn (*Zea mays*) and wheat (*Triticum* sp.).

Plantation Orchard. This community is the result of clearing native vegetation and deliberate planting and maintenance for Christmas tree and fruit production. Christmas tree plantations consist primarily of Fraser fir (*Abies fraseri*). Orchards contain apple (*Pyrus malus*) and pecan (*Carya illinoensis*) trees.

Residential/Disturbed Land. This community has been altered substantially from the natural condition and includes housing developments, maintained rights-of-way, roads, and roadside margins. Some of these areas have been overrun with invasive weedy species where left untended.

Wetlands and Waters of the United States

Water bodies such as rivers, lakes and streams are subject to jurisdictional consideration under Section 404 of the Clean Water Act. However, by regulation, wetlands also are considered "waters of the United States" (33 CRF 328.3). Wetlands are defined by the presence of three criteria: hydrophytic vegetation, hydric soils and evidence of hydrology during the growing season (DOA, 1987). The location of wetlands and water bodies in the project area south of the Blue Ridge Parkway is shown in Figure 4.

Rivers and streams within the project area are riverine in nature as defined by Cowardin *et al.* (1979), while wetlands in the project area are palustrine in nature. Jurisdictional areas in the project area are limited in extent and consist of the types described below.

The rivers and streams are primarily bank-to-bank, surface water systems and are considered riverine, upper perennial, unconsolidated bottom, permanently-flooded (R3UBH) systems. These systems are typically steep, with gravel, cobble or boulder substrates. They gather water from seeps and precipitation and channel it rapidly out of the area.

Man-made ponds in the project area are considered palustrine, unconsolidated bottom, permanently-flooded, impounded (PUBHh) systems. These appear to have been created primarily for recreational fishing and as reservoirs for crop irrigation and livestock watering.

Bog wetlands adjacent to streams are considered palustrine, forested, broad-leaved deciduous/needle-leaved evergreen, semipermanently-flooded (PFO 1/4F) systems. These wetlands support a canopy of red maple, sweet birch and eastern hemlock. The shrub layer may be dominated by rosebay rhododendron. Many herbs and mosses that have adapted to wetland hydrology carpet the wetland.

Protected Species

Federal Species. The following federal-protected Endangered (E), Threatened (T), or Proposed (P) species are listed by the US Fish and Wildlife Service (USFWS) as having ranges that extend into Caldwell (C) and Watauga (W) Counties as of May 2, 1997:

	Status	County
Spruce-fir moss spider (*Microhexura montivaga*)	E	C
Carolina northern flying squirrel(*Glaucomys*	E	W
sabrinuscoloratus)	E	W
Spreading avens (*Geum radiatium*)	E	W
Roan Mountain bluet *(Houstania montana*)	T	C,W
Heller's blazing star (*Liatris helleri*)	P	W
Bog Turtle (*Clemmys muhlenbergii*)		

The Spruce-fir moss spider inhabits moss mats that grow on rocks and boulders under high-altitude spruce-fir forests in the southern Appalachian Mountains. Adults are only 0.3 to 0.5 centimeters (0.1 to 0.2 inches) in length. This species is extremely vulnerable to desiccation and is adapted to the high rainfall of these mountains and the moist environment provided by the mosses (Harp, 1992). The preferred habitat of the Spruce-fir moss spider does not occur within the project area, and no records of this species are known from the project area.

The northern flying squirrel is a nocturnal denizen of mixed and coniferous forests in the northern United States and Canada. Adults range in size from 26 to 32 centimeters (10.5 to 12.5 inches) long. This squirrel has a loose, furred fold of skin on each side of the body between the wrists and the ankles that can be spread to form the wings for gliding. The northern flying squirrel is known from high-elevation, isolated pockets in the mountains of North Carolina, including Roan Mountain, Mt. Mitchell, and The Great Smokey Mountains (Wiegl, 1987). The preferred habitat of the northern flying squirrel does not occur within the project area, and no records of this species are known from the project area.

Spreading avens is an erect, densely hairy, perennial herb that grow to 51 centimeters (20 inches) tall. Bright yellow, five-petaled flowers are produced from June to August (Massey *et al*, 1983). Spreading avens is found in a few northwestern counties of North Carolina and in nearby counties of Tennessee. This species usually occurs at elevations greater than 1,524 meters(5,000 feet) on mountain balds, in crevices of granitic rock, or in grassy clearings; it cannot tolerate shading or crowding (Kral, 1983). Preferred habitat of spreading avens does not occur within the project area, and no records are known from the project area.

Roan Mountain bluet is a low, erect to spreading perennial herb that grows to 15 centimeters (6 inches) high. Small, deep purple flowers are produced in June and July. This species is endemic to the high Blue Ridge mountains of North Carolina and Tennessee, mostly from 1,280 to 1,920 meters (4,200 to 6,300 feet) in elevation. The Roan Mountain bluet grows in crevices of rock outcrops or in thin, frost-heaved, gravelly soils of grassy balds near summit outcrops (Weakley, 1993). The preferred habitat of this species does not occur in the project area, and no records are known from the project area.

Heller's Blazing star is an erect, herbaceous perennial that grows to 41 centimeters (16 inches) high. Small purple

to lavender tubular flowers bloom from July to September (Massey *et al.*, 1983). Distribution of Heller's blazing star is limited mostly to the mountains of North Carolina. Heller's blazing star is usually found in full sun growing in shallow, acid soils on granitic outcrops, ledges and cliff faces (Kral, 1983). The preferred habitat of this species only occurs adjacent to US 321. Heller's Blazing star was not found during a survey of bare, cut rock faces along existing US 321 in August 1994.

The bog turtle is a small turtle reaching an adult size of approximately 8 to 10 cm (3 to 5 inches). This otherwise darkly-colored species is readily identifiable by the presence of a bright orange or yellow blotch on the sides of the head and neck (Martof *et. al*., 1980). The bog turtle population has declined drastically within the northern portion of its range because of over-collection and habitat alteration. As a result, the USFWS officially proposed in the January 29, 1997 Federal Register (62 FR 4229) to list bog turtle as threatened within the northern portion of its range; and within the southern portion of its range, which includes North Carolina, the bog turtle is proposed for listing as threatened because of its similarity of appearance to the northern population. The proposed listing would allow incidental take of bog turtles in the southern population resulting from otherwise lawful activity.

The bog turtle is typically found in bogs, marshes, and wet pastures, usually in association with aquatic or semi-aquatic vegetation and small, shallow streams over soft bottoms (Palmer and Braswell, 1995). In North Carolina, bog turtles have a discontinuous distribution in the mountains and western piedmont. The preferred habitat of this species occurs within the project area (bog wetlands associated with the stream adjacent to Wonderland Drive, crossed by Alternatives E and F); however, the bog turtle has not been documented from the project area.

Federal Species of Concern. The May 2, 1997 USFWS list also includes a category of species designated as Federal Species of Concern (FSC). The FSC designation provides no federal protection for the species listed. There are 13 species with this designation listed for Caldwell County and 17 species with this designation listed for Watauga County.

Common Name	Scientific Name	County	Potential Habitat
Hellbender	*Cryptobranchus alleganiensis*	W	Yes
Cerulean warbler	*Dendroica cerulea*	W	Yes
Alleghany woodrat	*Neotama magister*	C, W	Yes
Southern water shrew	*Sorex palustris punctulatus*	W	Yes
Appalachian cottontail	*Sylvilagus obsurus*	W	Yes
Green floater	*Lasmigona subviridus*	W	No
Diana fritillary butterfly	*Speyeria diana*	C,W	Yes
Margarita River skimmer	*Macromia margarita*	C	No
Edmund's snaketail dragonfly	*Ophiogomphus edmundo*	C	Yes
Fraser fir	*Abies fraseri*	C,W	No
Mountain bittercress	*Cardamine clematitis*	C,W	Yes

Bent avens	*Geum geniculatum*	C,W	Yes
Butternut	*Juglans cinerea*	C,W	Yes
Gray's lily	*Lilium grayi*	C,W	Yes
Tall larkspur	*Delphinium exaltatum*	W	No
Glade spurge	*Euphorbia purpurea*	W	No
Bog bluegrass	*Poa paludigena*	W	Yes
Sweet pinesap	*Monotropsis odorata*	C,W	Yes
Riparian vervain	*Verbena riparia*	C	Yes
A liverwart	*Bazzania nudicaulis*	C,W	No
A liverwart	*Plagiochila sullivantii*	C	Yes

No FSC-designated species have been documented within the project area according to Natural Heritage Program (NHP) records (July, 1997). FSC-designated species that have been documented in the vicinity of the project area include gray's lily, which has been documented approximately 3.2 kilometers (2 miles) north of the project area in Moses Cone Memorial Park on the Blue Ridge Parkway; and the Allegheny woodrat, which has been documented approximately 0.3 kilometer (0.2 mile) west of the project area near "The Blowing Rock."

Habitat of many of these species occurs within the project area. The hellbender and Margarita River skimmer (dragonfly) are associated with larger streams; the cerulean warbler occurs on steep slopes and coves; the Allegheny woodrat, Appalachian cottontail, and sweet pinesap occur in rocky thickets and forests; the southern water shrew, Edmund's snaketail dragonfly, mountain bittercress, bent avens, and riparian vervain occur on montane stream banks; the Diana fritillary butterfly and butternut occur in rich forests; and gray's lily and bog bluegrass occur in bog wetlands. No FSC species were observed during site visits.

State Species. Species of mammals, birds, reptiles, amphibians, and plants with the North Carolina status of Endangered, Threatened or Special Concern receive limited protection under the North Carolina Endangered Species Act (G.S. 113-331 *et seq.*) and the North Carolina Plant Protection Act of 1979 (G.S. 106-202.12 *et seq.*). Based on a review of National Heritage Program (NHP) files (May 28, 1996), several state-listed species are known to occur within 3.2 kilometers (2 miles) of the project area.

Queen-of-the-prairie (*Filipendula rubra*) is a State Endangered grass that has been documented approximately 0.8 kilometers (0.5 mile) from the project area, adjacent to the east side of US 221/321 just north of the Blue Ridge Parkway. Gray's lily (*Lilium grayi*) is a State Threatened herb that has been documented approximately 3.2 kilometers (2 miles) north of the project area in Moses Cone Memorial Park on the Blue Ridge Parkway. The Allegheny woodrat (*Neotoma floridana magister*) is a State species of Special Concern that has been documented approximately 0.3 kilometers (0.2 mile) west of the project area near "The Blowing Rock."

3.3 HISTORIC RESOURCES

An historic architectural survey found that the project area contains one National Register historic district, Green Park Historic District, and two resources individually listed in the National Register, the Green Park Inn and the Bollinger-Hartley House. No properties are on the Department of Cultural Resources Study List. One property within the project area, the Five Points (A.L. Shuford House), is considered individually eligible for the National Register. A second property, the Young-Shaw-Steele House, is considered to be eligible for the National Register

as an expansion of the Green Park Historic District. These properties are shown in Figure 5 and descriptions are provided in the *Phase I Architectural Reconnaissance Survey* (March 1996) and *Phase II Architectural Survey* (February 1997). A field visit revealed two old houses on Thunder Mountain Road north of the Parkway, but no survey has been done to determine their eligibility.

3.4 VISUAL RESOURCES

The project area is in the Blue Ridge Mountains of western North Carolina, a very scenic section of the state. This area attracts many tourists because of its natural beauty and visual quality.

With the exception of an area at the southern end of the project area, which was clear cut in 1992, the entire project area is attractive visually, both north and south of the Blue Ridge Parkway. There are three locations in the area containing the potential bypass alternatives, however, that contain particularly high quality views. These are the Green Hill/Green Hill Road area, Assembly Grounds area, and the Blue Ridge Parkway.

3.4.1 Green Hill/Green Hill Road Area

High Quality Views

Many homes that line the ridge just east of Green Hill and Green Hill Road overlook the Blackberry Valley/Bailey Camp area. These are long-distance views overlooking numerous hills and valleys. The hills are forested. The bottoms of the valleys are developed as described in section 3.1.1 under "Blackberry Valley/Bailey Camp Community Area." At some locations, the vegetation partially obscures views.

Viewers

Residents of the homes lining the ridge are the primary viewers. There are no public viewpoints. This view cannot be seen from public roads.

3.4.2 Blowing Rock Assembly Grounds

High Quality Views

The main entrance to the lodge at the Assembly Grounds lodge overlooks the dense forest on the hillside between the lodge and the Blue Ridge Parkway. An open, grassy area lies below the lodge in the foreground. The view can best be seen after walking across the parking lot at the main entrance to the lodge. The view is the only one from the lodge that conveys the sense of remoteness desired at a retreat center.

Viewers

Persons attending retreats at the Assembly Grounds are the viewers. There are no public viewpoints. This view cannot be seen from public roads.

3.4.3 Blue Ridge Parkway

High Quality Views

The Blue Ridge Parkway is a National Park whose primary feature is a recreational road that offers drivers views of the mountains and the valleys below them. As such, the attractiveness of all views from the Parkway is important to achieving the Parkway's objectives. Protection of high quality views is a high priority for Parkway officials, particularly views from scenic viewpoints where drivers can stop along the Parkway and views that remain in the view of passengers in moving vehicles for longer than the few moments it takes to pass by them.

Most views from the Parkway into the project area are blocked by intervening hills and trees. This is particularly true west of Green Hill Road. At two locations, however, the project area can be seen readily from the Parkway. The first is the Thunder Hill overlook. Here, a parking lot is provided so Parkway visitors can stop and view Blackberry Valley and the surrounding hills. The landscape viewed is, for the most part, the same as that viewed from homes lining the Blue Ridge Flank east of Green Hill Road, although from a different angle. The view to the right from the Thunder Hill overlook includes the Blue Ridge Flank. Much of the flank is forested. Homes lining the top of the flank can be seen but are quite small because they are approximately 1,100 meters (3,600 feet) from the overlook. The view of the flank is partially blocked by Locust Ridge, which extends away from and perpendicular to the flank.

The second view of the project area from the Parkway is the Green Hill Road area. No opportunities to stop are provided to motorists, but views here are primarily open farmland, providing motorists with a roadside view that lasts more than a few moments. Motorists can see open pasture and some cultivated fields, as well as homes and other buildings, primarily those associated with the farmland. The open lands extend to the Parkway boundary.

Finally, Parkway officials also prefer that terrain be the primary determinant of whether development is being introduced to Parkway views. This position assumes that vegetation that now blocks views of development later could die, exposing additional development. Without existing vegetation, lands in the Thunder Mountain Road, Assembly Grounds, and Hillside Estates areas could be viewed from the Parkway.

Viewers

Viewers are the Blue Ridge Parkway users.

4. IDENTIFICATION AND DEVELOPEMENT OF POTENTIAL BYPASS ALTERNATIVES

4.1 DESIGN CRITERIA AND ASSUMPTIONS

4.1.1 Key Design Criteria

The design criteria and typical section used for the development of bypass alternatives are the same as those used for the widening alternative south of Blowing Rock. The functional classification of a Blowing Rock bypass would be rural arterial. The design speed assumed is 80 kph (50 mph). The typical section used (shown in Figure 6) includes four 3.6-meter (12-foot) travel lanes with a 1.2-meter (4-foot) flush median. Three-meter (10-foot) shoulders, of which 1.2 meters (4 feet) would be paved, are assumed. Because of the project area's mountainous terrain, a preferred maximum grade of seven percent is assumed, with an allowed maximum grade of eight percent.

4.1.2 Initial Location Selection Criteria

The following criteria were chosen initially by the study team for identifying potential bypass alternatives:

- Neither cross nor use lands from the Blue Ridge Parkway.
- Avoid concentrations of development.
- Avoid historic resources.
- Follow the natural terrain as much as possible to minimize heights of cuts and fills.
- Meet federal and state design criteria for roads of this type.
- Consider locations suggested by citizens, refining them as necessary to conform with the other criteria.

Bypass alternatives that crossed the Blue Ridge Parkway were not proposed initially because:

- Crossing the Parkway would reduce the effectiveness of the bypass in attracting traffic from existing US 321 to the bypass. The opportunity for the bypass to attract some local trips would be lost because the northern terminus would be well north of Blowing Rock's commercial areas. Through trips between the Parkway and points south of Blowing Rock would remain on existing US 321 unless the Parkway crossing included an intersection or an interchange (see section 6.1).
- A surface crossing would require a deep cut in the ridge paralleling the Parkway and, thus, would have a substantial visual impact on the Parkway.
- A tunnel under the Parkway would be extremely expensive.
- The Blue Ridge Parkway is both a public park and an historic resource. Its application for National Landmark status is pending. Federal law requires there be no other prudent and feasible alternative to use of lands from public parks and historic resources. A surface crossing of the Parkway would use park lands.
- In order to use lands from the Parkway, the NCDOT would have to purchase new Parkway lands

from the list of high priority lands included in the Parkway's approved Land Use Action Plan.
- The Environmental Impact Statement would need to evaluate the cumulative impact of the new crossing combined with all past, present and reasonable future actions affecting the Parkway regardless of what agency (federal or nonfederal) or person undertakes such actions. This would include all past and planned roadway projects affecting the Parkway since its construction.

All of the initial alternatives ended at Opossum Hollow Road. A terminus closer to the Parkway was not considered initially because, although it would reduce residential impacts, it would require a deep cut into an existing knob in order to keep the bypass' grades within the design criteria limits (eight percent). In contrast, there is a narrow valley at the Opossum Hollow Road location that would reduce the amount of earthwork required to build the bypass. A terminus closer to the Parkway ultimately was considered.

4.1.3 Location Selection Criteria Requested by Citizen Representatives

The Blowing Rock Town Council, the Concerned Citizens of Blowing Rock, and other citizens felt that their interests were not being represented by the initial bypass locations identified by the study team based on the location and design criteria presented in sections 4.1.1 and 4.1.2. Therefore, the study team evaluated several additional alternatives.

Location criteria particularly important to the Concerned Citizens of Blowing Rock were:

- Preferably begin the bypass south of the "S" curves at the last passing section on US 321 before Blowing Rock.
- Definitely begin south of the final sharp curves just south of the Blowing Rock Town Limits.
- Avoid displacement.
- Stay out of Blowing Rock completely.
- Cross the Parkway in a tunnel that is as short as possible. If one must remain south of the Parkway, parallel the Parkway as closely as possible.
- Minimize the use of grades greater than six percent.

The study team developed designs for and evaluated three alternatives proposed by the Concerned Citizens of Blowing Rock that included a tunnel under the Blue Ridge Parkway. The locations suggested by the citizens were used. Designs developed for these alternatives were reviewed with representatives of the Concerned Citizens prior to their completion. Grades greater that six percent were minimized; otherwise, the study team's design criteria were assumed. The completed designs conformed to the specifications requested by the Concerned Citizens except for tunnel length.

The tunnels were made longer than desired by the Concerned Citizens for two reasons: 1) the width of the ridge through which the tunnel passes is greater than the tunnel length desired by the Concerned Citizens and 2) a longer tunnel allows natural slopes to be retained above the portal end wall. Experience with other tunnels in the southeastern United States indicates that the height of portal cuts should be minimized to reduce the possibility of significant stability problems both during construction and in

service. Stabilizing unstable cut slopes can be expensive. Stabilizing a cut slope above the portal end wall is particularly important because, unlike cut slopes that parallel a highway, any rock that falls off slopes above the portal will fall directly on the highway or a passing vehicle.

The study team also developed designs for a tunnel alternative along a corridor preferred by the study team that was consistent with the Concerned Citizen's criteria listed above.

Finally, the study team examined the means for returning to US 321 just south of the Parkway as suggested by the Concerned Citizens of Blowing Rock. It rejoins US 321 at the New River Inn rather than Opossum Hollow Road and stays as close to the Blue Ridge Parkway boundaries as possible.

5. POTENTIAL BYPASS ALTERNATIVES

This section describes the potential bypass alternatives examined by the study team. The study team's initial bypass corridors are presented along with the additional alternatives developed in response to public comment. All of the alternatives are evaluated in section 6.

5.1 INITIAL BYPASS ALTERNATIVES

Ten bypass alternatives were selected initially for evaluation by the study team. They are shown in Figure 7 and are:

- A -- Begins just south of Falcon Crest Road, tops the Blue Ridge Flank near the Blue Ridge Parkway, and goes between the Assembly Grounds lodge and the Parkway to Opossum Hollow Road.
- AG -- Same as A, except it goes south of the Assembly Grounds lodge to Opossum Hollow Road.
- B -- Begins just north of Harrison Cemetery, tops the Blue Ridge Flank near the Blue Ridge Parkway, and goes between the Assembly Grounds lodge and the Parkway to Opossum Hollow Road.
- BG -- Same as B, except it goes south of the Assembly Grounds lodge to Opossum Hollow Road.
- C -- Begins near Greene Cemetery, tops the Blue Ridge Flank near the Blue Ridge Parkway, and goes between the Assembly Grounds lodge and the Parkway to Opossum Hollow Road.
- CG -- Same as C, except it goes south of the Assembly Grounds lodge to Opossum Hollow Road.
- D -- Begins at the last series of curves before Blowing Rock, tops the Blue Ridge Flank near the Blue Ridge Parkway, and goes between the Assembly Grounds lodge and the Parkway to Opossum Hollow Road.
- DG -- Same as D, except it goes south of the Assembly Grounds lodge to Opossum Hollow Road.
- E -- Begins at the last series of curves before Blowing Rock, tops the Blue Ridge Flank just east of Green Hill, and goes between the golf course and the Assembly Grounds to Opossum Hollow Road. This corridor is a refinement of the one presented in the 1993 EA.
- F -- This corridor is the same as E except it passes closer to the Blue Ridge Parkway as it joins Opossum Hollow Road (like A through D).

5.2 ADDITIONAL BYPASS ALTERNATIVES

5.2.1 Tunnel Alternatives

The Concerned Citizens of Blowing Rock proposed three potential bypass routes that cross the Blue Ridge Parkway in a tunnel. They are shown in Figure 8 and are:

1. CC-AI -- Begins just south of Falcon Crest Road, crosses Bolick Road on a bridge, crosses the Blue Ridge Parkway in a tunnel, and returns to existing US 321 at Aho Road following a route west of Thunder Mountain Road.

2. CC-BI -- Begins just south of Harrison Cemetery and quickly merges with Alternative CC-AI.

3. CC-CI -- Begins near Greene Cemetery and quickly merges with Alternative CC-AI.

AJ is a tunnel alternative developed by the study team. It begins just south of Falcon Crest Road, crosses Bolick Road on fill near Bolick Road's southern terminus, crosses the Blue Ridge Parkway in a tunnel, and returns to existing US 321 at Aho Road following a route east of Thunder Mountain Road. In addition to the inclusion of a tunnel, this alternative also differs from Alternative A in that it avoids displacing Bailey Camp Church and cemetery.

5.2.2 Additional Alternatives that Terminate South of the Parkway

The Concerned Citizens of Blowing Rock proposed an additional means for returning to US 321 just south of the Blue Ridge Parkway once the bypass reaches the top of the Blue Ridge Flank. This corridor was connected with three means for reaching the flank proposed by the Concerned Citizens as a part of their tunnel alternatives. The resulting three alternatives are shown in Figure 8 and are:

1. CC-AH -- Begins just south of Falcon Crest Road, tops the Blue Ridge Flank near the Blue Ridge Parkway, and remains adjacent to the Parkway until the bypass returns to existing US 321 near the New River Inn.
2. CC-BH -- Begins just south of Harrison Cemetery and quickly merges with Alternative CC-AH.
3. CC-CH -- Begins near Greene Cemetery and quickly merges with Alternative CC-AH.

5.3 MIXING AND MATCHING ALTERNATIVES

In general, the potential bypass alternatives shown in Figure 7 and Figure 8 can be divided into two geographic areas: south end corridor alternatives (A, CC-A, B, CC-B, C, CC-C, D, E, and F) and north end corridor alternatives (E, F, G, H, I, J). Most of the south end and north end alternatives can be mixed and matched to create additional corridor alternatives because, although the alternatives begin and end at different locations, they all follow the Blue Ridge flank at some point. With the exception of E and F, any south end alternative can be combined with any north end alternative. Alternatives E and F are the only alternatives that cross Green Hill Road just north of Green Hill. Because of the characteristics of the terrain, crossing Green Hill Road at that point is feasible only if the south end of the bypass begins just south of the Town Limits of Blowing Rock.

5.4 OTHER CITIZEN ALTERNATIVES

The alternatives in section 5.2 were proposed by citizens during the EIS bypass alternatives study. Numerous other bypass location alternatives were proposed by citizens during the EA preparation. The merits of these additional bypass alternatives and alternatives that involve the use of other roadways by US 321 traffic were discussed in the EA in sections 2.3.3 and 2.3.5.

Citizens also suggested during the EIS alternatives study that improving an alternate route that ultimately used US 421 to Boone would be a reasonable solution. Such an approach would not be effective, in part, because of the longer distance involved. The distance from NC 268 in Patterson to US 421 in Boone would be approximately 42 miles, about 18 miles longer than using US 321 from Patterson to Boone. This represents a travel increase of 83 percent. The disparity would be even greater for those traveling to Blowing Rock.

5.5 OTHER BYPASS ALTERNATIVES CONSIDERED

An additional corridor was considered by the study team as a potential bypass corridor. It started at the same point as Alternative A, but followed a ridge line further east than Alternatives A, AG, CC-A, AJ, and CC-B, reducing the length of road following the Blue Ridge Flank below Blowing Rock. This alternative was dropped from consideration for the following reasons:

- It would involve 13.5 million cubic meters (17.6 million cubic yards) of earthwork compared to 5.9 million cubic meters (7.7 million cubic yards) with Alternative A.
- It would be 0.2 kilometer (0.1 mile) longer than Alternative A and would involve 0.3 kilometer (0.2 mile) more of 8 percent grades.

6. TRAFFIC AND LEVEL OF SERVICE WITH A BLOWING ROCK BYPASS

6.1 TRAFFIC VOLUMES

Traffic forecasts for 1994 and 2025 with the No-Build Alternative were presented in Table 1. Traffic forecasts for 2025 with a Blowing Rock bypass are shown in Table 7, which shows the average daily traffic (ADT) in May for each major link of the existing roadway and for different potential bypass locations. These forecasts were prepared by the NCDOT Division of Highways-Statewide Planning Branch. The 1994 May ADT are actual counts taken as a part of preparation of a new Boone thoroughfare plan. May was chosen for the counts by the NCDOT after consultation with local officials. The forecast traffic volumes were modeled based on current traffic movement patterns between origin and destinations in the area combined with municipal and county development forecasts and land use plans.

A Blowing Rock bypass would reduce traffic volumes on existing US 321. With a bypass, the 2025 ADT on existing US 321 in Blowing Rock would range between 4,000 and 21,350 vehicles, depending upon the location of the existing road and the bypass configuration. The bypass would carry an ADT between 7,150 and 11,900 vehicles depending upon the configuration. In general, the alternatives that begin closer to Blowing Rock on the south (i.e. near the Blowing Rock Town Limits) would carry higher volumes than other alternatives because they would be used more by local traffic. Alternatives that begin near the Town Limits and cross the Blue Ridge Flank near the Blue Ridge Parkway are exceptions because the bypass routes in those cases are longer than the existing route. There would be less use of the bypass by local traffic when the bypass route is longer than the existing route. Ten to 19 percent fewer trips would shift to the bypass from existing US 321.

A bypass that crossed the Blue Ridge Parkway would reduce traffic volumes on existing US 321 but less than one that did not cross the Parkway (see Table 7). Additionally, a bypass that crossed the Parkway would carry less traffic than one that did not cross the Parkway. The 2025 ADT on a bypass that did not cross the Parkway would be between 8,100 and 11,900, while a bypass that crossed the Parkway would carry an ADT of only 7,150. The addition of an interchange with the Parkway would result in better bypass volumes, but lower than most other bypass alternatives that do not cross the Parkway.

An additional evaluation was done to include intersections with other local streets in Blowing Rock for each alternative that does not cross the Parkway. These numbers also are shown in Table 7. Local intersections on the bypass only decrease US 321 traffic by 0 to 3 percent; therefore, the use of local intersections as a means of further reducing traffic on US 321 was not pursued during the design of the alternatives.

The NCDOT forecasts indicate that traffic during the peak hour on the bypass would include six percent dual axle trucks and three percent tractor-trailer trucks (nine percent total). In Blowing Rock, existing US 321 would carry three percent dual axle trucks and two percent tractor-trailer trucks if a bypass were built (five percent total). Without a bypass, US 321 peak hour traffic in Blowing Rock would include six

percent dual axle trucks and three percent tractor-trailer trucks (nine percent total).

6.2 LEVEL OF SERVICE

This section summarizes the level of service analysis for potential bypass locations. Definitions for each level of service (LOS) were presented in Table 2. Levels of service for the No-Build Alternative in 1994 and 2025 for various segments of US 321 were shown in Table 3 and Table 4.

Traffic capacity was analyzed for each potential bypass location. For each alternative, the impacts on existing US 321 also were analyzed in order to evaluate thoroughly the impacts of diverting traffic. Table 8 presents roadway level of service and Table 9 presents intersection level of service. In general, the traffic capacity analysis results did not vary substantially for the different bypass alternatives. The 2025 level of service on the bypass would be LOS A in every case. On existing US 321, which would remain a two-lane road, the level of service would be LOS E between its intersection with the bypass and Green Hill Road because of steep grades and the inability to pass slow-moving vehicles. The level of service on existing US 321 generally would be LOS C or D in Blowing Rock.

6.2.1 Bypass

A four-lane bypass would operate at LOS A with a typical four-lane section regardless of the terminus points or number of access locations.

Potential intersections along a bypass were analyzed as unsignalized. Most intersections between the two termini would operate at LOS D or better. A Green Hill Road intersection would operate at levels E/F with some alternatives that do not cross the Parkway and would warrant a signal (ADT-based warrant Figure 2-10, *Institute of Transportation Engineers Manual of Traffic Signal Design, Second Edition*).

6.2.2 Existing US 321

Any bypass corridor would reduce volumes on the existing sections of US 321 in Blowing Rock, as shown in Table 7. Traffic in 2025 would be similar to or slightly less than existing volumes through a major portion of US 321 in the Town of Blowing Rock.

With any bypass corridor, US 321 in Blowing Rock would improve to LOS C/D. A LOS D operation would occur on US 321 north of Sunset Drive with any bypass. Crossing the Parkway with no connection also would result in LOS D between Goforth Road and US 321 Business. A LOS D can be acceptable, but is not desirable, on the existing US 321 with a bypass in place.

The US 321 section south of Blowing Rock between the terminus of the bypass and Green Hill Road would operate at LOS E if it remained a two-lane highway because of steep grades and the inability to pass slow-moving vehicles. This means that the longer alternatives would correspond to a greater

segment of US 321 operating at LOS E because it would remain unimproved. Thus, this section would warrant upgrading to a four-lane highway for an acceptable level of service. Despite the level of service classification, however, this section would be carrying less traffic and a lower percentage of trucks in 2025 than the existing 1994 traffic counts.

The signalized intersection at US 221 would operate at LOS D or better with all alternatives. The US 321/Sunset Drive intersection would operate at LOS D or better with several alternatives. With other alternatives, it would function at LOS E or worse unless an eastbound left turn lane were provided. This turn lane is assumed in Table 9.

All unsignalized intersections (except US 321/Food Lion) would operate at LOS C or better with any of the bypass alternatives. Left turns from the Food Lion driveway into southbound US 321 are forecast to operate at LOS F or greater. However, the analysis model does not take into account large gaps created by the signals north and south of this intersection. These gaps would provide sufficient capacity for these left turns and would result in a much better level of service than indicated by the model.

6.2.3 Southern Terminus

The southern terminus was analyzed as a T-intersection with the existing US 321 ending perpendicular to the bypass. Unless a signal were provided, the left turns from existing US 321 onto the US 321 northbound bypass would operate at LOS F irrespective of the bypass option. A planning level signal warrant analysis (ADT-based warrant using Figure 2-10, *Institute of Transportation Engineers Manual of Traffic Signal Design, Second Edition*) indicated the need for a signal regardless of the bypass option chosen. A signal would result in an acceptable level of service at this intersection.

6.2.4 Northern Terminus

The northern terminus of the new bypass was assumed to connect into the Shoppes on the Parkway/US 321/Opossum Hollow Road intersection, forming a four-leg intersection. The level of service analysis indicated that a signalized intersection would require provision of full turn lanes on the northbound and southbound approaches of the existing US 321 to operate at LOS D or better.

6.3 CAPACITY SENSITIVE ANALYSIS

An additional analysis was conducted to determine the long-term road capacity impacts of maintaining a 2.5 percent traffic growth rate beyond the 2025 design year. If traffic were to rise in steady increments from 1994 to 2025, the annual traffic growth rate would be 2.5 percent. The additional analysis was done separately for US 321 between Green Hill Road and US 321 Business (historic/residential area) and between US 321 Business and US 221 (commercial area). These two segments were chosen because the historic/residential area is more sensitive from an environmental impact perspective than the commercial area. The section between US 221 and Shoppes on the Parkway was not included in the sensitivity analysis because it is already a four lane road. Table 10 summarizes the results of this analysis. For each

segment, the years shown in the table are the first year level of service D or E is achieved on at least one roadway link (road between intersections) in the segment. LOS D and E operation were chosen for this analysis since they indicate when additional improvements may be required. The ranges shown reflect the differing traffic forecasts associated with the bypass alternatives.

Table 10 shows that with the widening alternative, further improvements, such as a bypass, would not need to be considered until 10 to 15 years beyond 2025. The need for further improvements would be associated with traffic between US 321 Business and US 221/US 321 Business.

A bypass that did not cross the Parkway would postpone the need to consider improvements to existing US 321 between Green Hill Road and US 321 Business well beyond (up to 15 to 30 years) the 2025 design year. A bypass that crossed the Parkway in a tunnel would increase traffic enough on US 321 to move the time for considering additional improvements in this area up by about 15 years.

Between US 321 Business and US 221/US 321 Business, the need for considering improvements to the existing road could come before or shortly after the 2025 design year with any bypass alternative.

7. ASSESSMENT OF POTENTIAL BYPASS ALTERNATIVES

Engineering, traffic, social, cultural resource, natural resource, and visual considerations were taken into account in comparing the potential bypass alternatives. Table 11 summarizes this comparison for the 17 bypass alternatives. It contains the following evaluation criteria:

- Engineering considerations Cost
  - Earthwork
  - Grades
  - Horizontal curves
- Traffic considerations
  - 2025 Average Daily Traffic
  - 2025 Peak Hour Level of Service
- Social considerations
  - Displacement
  - Other community impacts
- Natural resource considerations
  - Area of new right-of-way
  - Length of new road
  - Wetlands crossed and area
- Historic resource considerations
- Visual resource considerations

All comparisons assume complete and equivalent projects. They all begin immediately south of Falcon Crest and end at US 321 somewhere north of Blowing Rock (at Opossum Hollow Road, between Moses Cone Park and Parkway, or north of Parkway at Aho Road). On the south, shorter bypasses include the applicable section of widening. Appendix A contains a preliminary assessment that was prepared for the 10 initial bypass alternatives discussed in section 5.1. It was prepared prior to the decision to evaluate alternatives that cross the Blue Ridge Parkway in a tunnel or return to existing US 321 closely paralleling the Blue Ridge Parkway. It contains much of the same information as Table 11, as well as additional cultural and natural resource information.

As discussed in section 5.3, in general, the potential bypass alternatives shown in Figure 7 and Figure 8 and described in Table 11 can be divided into two geographic areas: south end corridor alternatives (A, CC-A, B, CC-B, C, CC-C, D, E, and F) and north end corridor alternatives (E, F, G, H, I, J). Most of the south end and north end alternatives can be mixed and matched to create additional corridor alternatives because, although the alternatives begin and end at different locations, they all follow the Blue Ridge flank at some point. This division is illustrated in Figure 9A and Figure 9B. With the exception of E and F, any south end alternative can be combined with any north end alternative.

The termini for the south end and north end alternatives are:

- South end termini:
  - South of the Falcon Crest subdivision and "S" curves ("A" and "CC-A" alternatives)
  - North of Falcon Crest and south of "S" curves ("B" and "CC-B" alternatives)
  - North of "S" curves and south of sharp curves south of Blowing Rock ("C" and "CC-C" alternatives)
  - Near town limits of Blowing Rock ("D" alternatives, E, and F)
- North end termini:
  - Opossum Hollow Road south of Blue Ridge Parkway ("A," "B," "C," "D," and "G" alternatives and Alternatives E and F)
  - Between Moses Cone Park and Blue Ridge Parkway ("H" alternatives)
  - Cross Blue Ridge Parkway in a tunnel and end near the intersection of US 321 and Aho Road ("I" and "J" alternatives)

In the remainder of this report, complete alternatives will be referred to as Alternative AG, Alternative E, Alternative CC-BH, Alternative CC-CI, etc. When referring to the south end or north end components of the alternatives, the following notation is used: "A" alternatives, "I" alternatives, etc.

The paragraphs below assess each of the alternatives based on the above divisions. Each alternative's location, advantages and disadvantages are described. In January 1997, the advantages and disadvantages of each alternative were distributed to the project's Citizens' Advisory Committee and state and federal regulatory agencies in a questionnaire that asked recipients to indicate whether or not they believed each alternative should be evaluated in detail in the Environmental Impact Statement. The responses to this questionnaire also are described below for each alternative. Of the 18 persons who responded to the questionnaire, five answered "no" to all bypass alternatives, indicating their belief that no bypass is reasonable. Another three responded in letters that did not indicate preferences for specific alternatives listed in the questionnaire. A summary of responses by respondent is included in Table 12 in section 9.3.

7.1 SOUTH END ALTERNATIVES

This evaluation considers the segment of each bypass alternative, from its southern terminus to its location on the Blue Ridge Flank (see Figure 9A). Where applicable, it includes the appropriate length of widening.

7.1.1 "A", "CC-A", "B", and "CC-B" Alternatives

Location

These alternatives would start south of the "S" curves on US 321 just south of the Falcon Crest subdivision.

Advantages

Traffic. The further south the bypass begins, the less road construction US 321 users would encounter. These alternatives start the furthest south. The NCDOT, however, will impose a traffic management plan on its contractor and two lanes of travel will remain open virtually all the time when the existing road is being widened. As indicated in the 1993 Environmental Assessment, procedures that require the closure of one lane and the use of flagmen are expected to occur sporadically and during off-peak travel hours. Brief periods of full closure would occur when blasting charges are detonated. As with lane closures, blasting would occur only during off-peak travel hours.

The further south the bypass begins, the more opportunity there exists for travelers to avoid six to eight percent grades on the existing road. It is expected that 7,200 to 11,000 vehicles would use the bypass on the average day in 2025. There is, however, only 1.0 kilometer (0.6 mile) of grades greater than six percent between the starting point of these alternatives and the starting point of the "C" and "CC-C" alternatives. The balance of this portion of US 321 has grades of 1.5 to 5 percent, not as steep as a bypass.

Bypass users would avoid seven curves with less than a 50 mph design speed just south of Blowing Rock. These curves would not be corrected fully with the widening alternative. The design speeds for these curves would range from 45 mph down to 20 mph. An eighth curve would achieve a 50 mph design speed.

Community Impacts. Displacement of existing land uses would be lower with these alternatives. For example, most bypass alternatives that begin south of the "S" curves would displace only one or two homes south of Blowing Rock. The "B" alternative would displace approximately eight homes south of Blowing Rock. By diverting traffic from US 321, a longer bypass also would reduce noise levels at homes along the existing route.

Disadvantages

Cost. Starting further south would increase total project cost. For example, the non-tunnel bypass locations using the "A", "CC-A", "B", and "CC-B" south end alternatives would have a construction cost of $47.5 to $92.6 million. The bypass locations using the "D" south end alternative, which begins near the town limits of Blowing Rock, would cost $41.9 to $43.8 million.

The further south the bypass begins, the longer the distance drivers remaining on the existing road south of Blowing Rock (4,400-7,500 vehicles on the average day in 2025) would suffer from narrow lanes, sharp curves, and congestion. Such problems could be corrected by widening the existing road and starting the bypass further north. The "A" and "CC-A" alternatives would leave 5.6 kilometers (3.5 miles) of US 321 south of Blowing Rock unimproved. The "B" and "CC-B" alternatives would leave 4.3 kilometers to 4.5 kilometers (2.7 to 2.8 miles) of US 321 south of Blowing Rock unimproved.

Natural Resource Impacts. The further south the bypass begins, the greater the loss of undisturbed

wildlife habitat. Since these alternatives begin the furthest south, they would result in the greatest loss of undisturbed wildlife habitat.

Community Impacts. The longer bypass routes would introduce more new thoroughfare to rural communities, primarily Bailey Camp and Blackberry Valley, which now only have low levels of local traffic passing through them. It is also possible that these alternatives would displace the Bailey Camp Baptist Church and cemetery or place a large fill or retaining wall adjacent to it. The large fill would be needed because the road would be shifted from the top of the ridge to the side of the ridge to save the church and cemetery. Saving the church and cemetery would add approximately $15 million to the bypass' earthwork costs, assuming the designs used for the "CC-A", CC-B", and AJ alternatives. These designs assume a maximum 6.25 percent grade. With these alternatives, the elevation of the road fill would be 150 feet higher than the elevation of the church and cemetery. The fill height could be lowered, decreasing the extra earthwork cost, if grades were increased north of this point. For example, with an eight percent maximum grade, a design passing through this area would be 50 feet above the church and cemetery.

Some of the potential alignments would cross Bolick Road on a long, high level bridge. However, this bridge, which would be 487.7 meters (1,600 feet) long, have an average height of 35.1 meters (115 feet) and a maximum height of 56.1 meters (184 feet), would be a substantial new visual feature in the community served by Bolick Road. In addition, such a bridge would add $4.4 million to project costs (compared to the "A" alternatives that do not cross the valley).

Historic Resource Impacts. While on the Blue Ridge Flank, these alternatives would pass through the property containing the Five Points (A.L. Shuford) House. The bypass would be below the home, which is potentially eligible for the National Register of Historic Places. All bypass alternatives that follow the Blue Ridge Flank would use land from this property, which extends down the Blue Ridge flank to about 975 meters (3,200 feet) in elevation. The home is at an elevation of about 1,160 meters (3,800 feet).

Lowering the bypass on the Flank at this point to the elevation required to avoid the property (roadway centerline at about 910 to 950 meters or 3,000 to 3,100 feet of elevation) would make it impossible to gain the elevation needed to reach the top of the Flank (1,100 meters or 3,600 feet in elevation) and return to US 321 south of the Blue Ridge Parkway. The distance available would be too short (about 670 meters or 2,200 feet) to allow for acceptable road grades. A tunnel under the Parkway would be physically possible but not reasonable. Large fills (as high as 85 meters or 280 feet) would be needed for a distance of approximately 670 meters (2,200 feet) to reach a south tunnel portal at an approximate elevation of 1,050 meters (3,450 feet). Grades approaching the south portal and in the tunnel would have to be approximately 7.5 percent. The south portal could not be lowered further. The topography on the north side of the Parkway all the way to Aho Road is above 1,037 meters (3,400 feet). Thus, to keep the tunnel to a reasonable length, its north portal needs to be at about 1,100 meters (3,600 feet).

If the property is eligible for the National Register, the requirements of Section 4(f) of the Department of Transportation Act of 1966 would apply.

Citizens' Advisory Committee and Agency Response

There was little support among Citizens' Advisory Committee and agency questionnaire respondents for a bypass with a southern terminus this far south. Several members of the Citizens' Advisory Committee were concerned about the potential impacts of these alternatives on the Bailey Camp Church and cemetery and the rural communities in the valley. Cost and natural resource impacts were concerns for almost everyone who rejected these alternatives. Concern also was expressed as to whether truck drivers would find such a bypass preferable over the existing route. Those who indicated a preference for these alternatives considered them desirable because bypass users would avoid more of the steep grades and sharp curves on existing US 321. They suggested that impacts to the church and community could be minimized. In the past, the minimization of traffic disruption on US 321 during project construction has been cited as a benefit of these alternatives.

7.1.2 "C" and "CC-C" Alternatives

Location

These alternatives would start north of the "S" curves but south of the sharp curves just below the Town of Blowing Rock near Greene Cemetery.

Advantages

Cost. Construction costs for the bypass segment would be less than with the longer "A", "CC-A", "B", and "CC-B" alternatives.

Traffic. Bypass users would avoid seven curves with less than a 80 kph (50 mph) design speed. These final curves before Blowing Rock would be improved but not corrected fully with the widening alternative. The design speeds for these curves would range from 45 mph down to 20 mph. An eighth curve would achieve a 50 mph design speed. These south end alternatives would leave only 2.4 kilometers (1.5 miles) of existing US 321 unimproved south of Blowing Rock. For this distance, between 4,400 and 7,500 vehicles on the average day in 2025 would suffer from the narrow lanes and congestion that could be corrected by widening the existing road and starting the bypass further north. This distance is much less than the unimproved distances left with the "A", "CC-A", "B", and "CC-B" alternatives (4.3 to 5.6 kilometers [2.7 to 3.5 miles]).

Natural Resource Impacts. The loss of undisturbed wildlife habitat would be less than with the "A", "CC-A", "B", and "CC-B" south end alternatives. For example, 24.2 hectares (60 acres) of land would be cleared and grubbed below the top of the Blue Ridge flank with the "CC-C" alternative, while the "CC-A" alternative would require 48.6 hectares (120 acres) of land to be cleared and grubbed below the top of the Blue Ridge Flank (some of that area was clear-cut in recent years).

Community Impacts. There would be less new thoroughfare introduced to rural communities than with

the bypass alternatives that begin further south. For example, the "CC-A" alternative has 6.1 kilometers (3.8 miles) of new road below the top of the Blue Ridge flank, while the "CC-C" alternative has only 3.0 kilometers (1.9 miles) of new road below the top of the Blue Ridge flank.

Disadvantages

Traffic. Traffic on US 321 would pass through an additional 1.9 to 3.2 kilometers (1.2 to 2.0 miles) of road construction than with the "A", "CC-A", "B", and "CC-B" alternatives. The NCDOT, however, would impose a traffic management plan on its contractor and two lanes of travel would remain open virtually all the time during construction when the existing road is widened. An additional disadvantage from the traffic perspective is that less opportunity would exist for travelers to avoid six to eight percent grades on the existing road (1.0 kilometer [0.6 mile] more of six to eight percent grades with the "C" and "CC-C" alternatives than the "A" and "CC-A" alternatives). It is expected that 7,200 to 11,000 vehicles would use the bypass on the average day in 2025.

Community Impacts. Approximately 14 homes would be displaced south of Blowing Rock with the "C" and "CC-C" alternatives. These displacements are associated primarily with the widening portion of the alternatives. Additionally, most noise impacts associated with the widening alternative would remain.

Historic Resource Impacts. Like the "A", "CC-A", "B", and "CC-B" alternatives, while on the Blue Ridge Flank, these alternatives would pass through the property containing the Five Points (A.L. Shuford) House. The bypass would be below the home, which is potentially eligible for the National Register of Historic Places. If the property is eligible for the National Register, the requirements of Section 4(f) of the Department of Transportation Act of 1966 would apply. The viability of options to avoid the property were described above in section 7.1.1 under "Historic Resources."

Citizens' Advisory Committee and Agency Response

There was no agency support for a bypass with this southern starting point. They, along with several Citizens' Advisory Committee respondents contend that the community and natural resource impacts to the Blackberry Valley and Bailey Camp areas are too great to warrant further consideration. A few Citizens' Advisory Committee members indicated a preference for such a southern terminus. They thought that this was as close as a bypass could come to the Town of Blowing Rock without having adverse community and environmental impacts. They also indicated that bypass users still would avoid several of the sharp curves on US 321 south of the Town Limits.

7.1.3 "D", "E", and "F" Alternatives

Location

These south end alternatives would begin just south of the Blowing Rock Town Limits.

Advantages

Cost. Alternatives that begin at this point would have the lowest construction costs. As indicated in Table 11, total construction costs for these alternatives would range from $34.5 million for "E" to $43.8 million with DG.

Traffic. These alternatives would leave very little (0.0 to 0.4 kilometers [0.0 to 0.25 miles]) of existing US 321 unimproved south of Blowing Rock. This means that users of the existing highway would no longer have to suffer from the narrow lanes and many of the sharp curves currently found on the existing route; however, they would have to pass through the final curves on existing US 321 before Blowing Rock, an area where sharp curves (20 to 45 mph design speeds) and steep grades (6.6 to 7.6 percent) would remain with the widening alternative.

Natural Resource Impacts. These alternatives would do the best job of avoiding undisturbed wildlife habitat south of Blowing Rock.

Community Impacts. These alternatives would have the least impact on communities south of Blowing Rock.

Disadvantages

Traffic. With the "D" south end alternative, a bypass would be longer than the existing road, making it less attractive to local traffic that might choose to use the bypass instead of the existing road. This is not the case with alternatives E and F or any other of the alternatives that end south of the Blue Ridge Parkway.

Traffic on US 321 would pass through 4.0 to 5.6 kilometers (2.5 to 3.5 miles) more of road construction than with "A", "CC-A", "B", and "CC-B" alternatives and 2.1 to 2.4 kilometers (1.3 to 1.5 miles) more than with the "C" and "CC-C" alternatives. The NCDOT, however, would impose a traffic management plan on its contractor and two lanes of travel would remain open virtually all the time during construction when the existing road is being widened.

Furthermore, with these alternatives, less opportunity would exist for travelers to avoid six to eight percent grades on the existing road (3.0 to 3.4 kilometers [1.9 to 2.1 miles] more of six to eight percent grades with the "D" alternative than the "A" and "CC-A" alternatives and 2.1 to 2.4 kilometers [1.3 to 1.5 miles] more of six to eight percent grades than the "C" and "CC-C" alternatives). It is expected that 7,200 to 11,000 vehicles would use the bypass on the average day in 2025. All traffic would pass through five ("D" alternatives) to seven (alternatives E and F) curves with less than a 80 kph (50 mph) design speed.

Community Impacts. The southern portion of these alternatives is primarily their widening segment. Twelve homes would be displaced. In addition, the noise impacts south of Blowing Rock along existing US 321 would remain.

Historic Resource Impacts. Like the "A", "CC-A", "B", "CC-B", "C", and "CC-C" alternatives discussed above, while on the Blue Ridge Flank, the "D" alternatives would pass through the property containing the Five Points (A.L. Shuford) House. The bypass would be below the home, which is potentially eligible for the National Register of Historic Places. If the property is eligible for the National Register, the requirements of Section 4(f) of the Department of Transportation Act of 1966 would apply. The viability of options to avoid the property were described above in section 7.1.1 under "Historic Resources." As discussed below in sections 7.2.1 and 7.2.2, Alternatives E and F can be designed to avoid the use of historic resources.

Citizens' Advisory Committee and Agency Response

A majority of the agency respondents indicated a preference for a bypass alternative with this southern terminus primarily because of its lower cost and minimization of natural resource and community impacts in the rural areas south of Blowing Rock. Citizens' Advisory Committee respondents were less enthusiastic about such a southern terminus. A majority of the respondents believed that these alternatives were too close to Blowing Rock and would have detrimental effects on the Town.

7.2 NORTH END ALTERNATIVES

This evaluation focuses on the segment of each bypass alternative from its location on the Blue Ridge Flank to its northern terminus (see Figure 9B).

7.2.1 Alternative E

Location

Alternative E would top the Blue Ridge Flank just north of Green Hill and take a direct route to the Opossum Hollow Road/US 321 intersection.

Advantages

Cost. This alternative is the lowest cost bypass alternative, with a total construction cost of $34.5 million. Three factors, in particular, contribute to the relative inexpensiveness of Alternative E: 1) it would require the least amount of earthwork, 2) it would have the narrowest footprint, and 3) it would be the shortest alternative.

Traffic. Alternative E would divert the most amount of traffic from existing US 321.

Visual Impacts. According to representatives of the National Park Service, this alternative would have the least visual impact on the Blue Ridge Parkway.

Community Impacts. This alternative would have the least effect on the Blowing Rock Assembly Grounds.

Historic Resource Impacts. Alternative E could avoid use of National Register-eligible properties. The representative design used to evaluate Alternative E shows the involvement of properties potentially eligible for the National Register of Historic Places. The assessed design for Alternative E uses property associated with the Five Points (A.L. Shuford House) and property associated with the Young-Shaw-Steele House (in a proposed extension of the Green Park Historic District). The locations of these properties were shown in Figure 5. The representative design for Alternative E was developed before the determinations of potential eligibility and property boundaries were made. A reexamination of the design indicates that it could be adjusted to avoid these properties. Adjusting Alternative E to avoid the Five Points property completely could result in the displacement of an additional two homes. An adjusted E also would encroach about 200 feet further into the Blowing Rock Assembly Grounds at its service entrance. The magnitude of the other impacts for Alternative E should not change.

Disadvantages

Natural Resource Impacts. This alternative would cross one wetland, resulting in a loss of 0.3 hectare (0.7 acre).

Community Impacts. Alternative E has the second greatest potential for displacement, with 20 homes in its northern portion. Most of this displacement would occur in the Green Hill Road, Wonderland Drive, and Opossum Hollow Road communities. This alternative would be closest to the most heavily developed areas of Blowing Rock; however, displacement of homes on top of Green Hill generally would be avoided.

Citizens' Advisory Committee and Agency Response

Only one Citizens' Advisory Committee respondent supported this alternative. Almost all of the others believed that it would have too many community impacts in Blowing Rock, particularly in the Green Hill neighborhood and along Green Hill and Opossum Hollow Roads. Agency respondents who supported this alternative cited cost, minimal impacts to natural resources, and minimal visual impacts on the Blue Ridge Parkway as their reasons.

7.2.2 Alternative F

Location

Alternative F would top the Blue Ride Flank just north of Green Hill and pass north of the Blowing Rock Assembly Grounds lodge before ending at US 321 in the Opossum Hollow Road area.

Advantages

Cost. This alternative would have the second lowest total construction cost, $34.5 million. This cost is similar to the total cost of "D", as shown in Table 11.

Traffic. Like Alternative E, this alternative does well in attracting traffic from existing US 321.

Visual Impacts. Alternative F would be second best (compared to Alternative E) in minimizing visual impact to the Blue Ridge Parkway.

Disadvantages

Natural Resource Impacts. This alternative would result in the loss of 0.5 hectare (1.1 acres) of wetlands.

Community Impacts. This alternative is one of several that would have the greatest impact on the Blowing Rock Assembly Grounds. It would replace current forest views from the lodge with views of the bypass. Also, natural areas used by retreat participants would be used, a marked trail would be displaced, and the entrance to the Assembly Grounds would be altered.

Additionally, the potential for displacement is greatest with this north end alternative. Although homes on top of Green Hill would be avoided, 23 homes would be displaced in the Green Hill Road, Wonderland Drive, Goforth Road, and Opossum Hollow Road communities.

Historic Resource Impacts. Alternative F could avoid use of National Register-eligible properties. The representative design used to evaluate Alternative F shows the involvement of properties potentially eligible for the National Register of Historic Places. The assessed design for Alternative F uses property associated with the Five Points (A.L. Shuford House). The locations of these properties were shown in Figure 5. The representative design for Alternative F was developed before the determinations of potential eligibility and property boundaries were made. A reexamination of the design indicates that it could be adjusted to avoid these properties. Adjusting Alternative F to avoid the Five Points property completely could result in the displacement of an additional two homes. The magnitude of the other impacts for Alternative F should not change.

Citizens' Advisory Committee and Agency Response

As with Alternative E, there was little support among Citizens' Advisory Committee respondents and widespread support among agency respondents for this alternative. The reasons cited are basically the same for both groups of respondents - to agency representatives, it is less costly and minimizes natural resource impacts; to Citizens' Advisory Committee members, it involves substantial community impacts to the Green Hill and Opossum Hollow Road areas.

7.2.3 Original A, B, C, and D Alternatives

Location

This north end alternative would pass between the Assembly Grounds lodge and the Blue Ridge Parkway and end at Opossum Hollow Road.

Advantages

Traffic. As with many other north end alternatives, this one would do well in attracting traffic from existing US 321.

Visual Impacts. Once one leaves the Blue Ridge flank and the Craig farm area, views from the Blue Ridge Parkway would be blocked by the terrain.

Disadvantages

Cost. The cost of this north end alternative could be the lowest of the corridors that top the Blue Ridge flank near the Blue Ridge Parkway, but only if an eight percent grade were maintained from the Blowing Rock Assembly Grounds to almost the US 321/Opossum Hollow Road intersection. If a shallow grade were introduced approximately 1,100 feet from US 321, the earthwork would increase and costs would increase by about $10 million.

Visual Impacts. This alternative would replace current forest views from the Assembly Grounds lodge with views of the bypass. Also, it would be within views from the Thunder Hill overlook and within views of the Green Hill Road area from the Blue Ridge Parkway.

Community Impacts. Along with Alternative F, this north end alternative would have the greatest impact on the Assembly Grounds. Natural areas used by retreat participants would be used, a marked trail would be displaced, and the entrance to the Assembly Grounds would be altered.

Furthermore, up to 20 homes could be displaced in the Green Hill Road (Craig farm area), Goforth Road, and Opossum Hollow Road communities. This number could be reduced substantially in the Heather Ridge Lane area, but earthwork costs would increase.

Citizens' Advisory Committee and Agency Response

Neither the Citizens' Advisory Committee respondents nor the agency respondents expressed support for this north end alternative. Concerns included visual impacts to the Blue Ridge Parkway, impacts to the residential communities in the Green Hill and Opossum Hollow Road areas, and impacts to the Blowing Rock Assembly Grounds. Many Citizens' Advisory Committee respondents expressed concerns about congestion and safety at the busy intersection of US 321/Opossum Hollow Road/Shoppes on the Parkway. This concern also would apply to Alternatives E and F and any "G" alternative.

7.2.4 "G" Alternative

Location

This alternative, which was used to form Alternatives AG, BG, CG, and DG, would pass through the southeast part of the Blowing Rock Assembly Grounds and continue to Opossum Hollow Road.

Advantages

Cost. Costs for the "G" alternative are only slightly higher than with the original A, B, C, and D described in the previous section. "G" would include shallower grades (6.5 percent maximum) at the lowest cost.

Traffic. As with the previous north end alternatives, this alternative would do well in attracting traffic from existing US 321.

Visual Impacts. Once one leaves the Blue Ridge Flank and Craig farm area, views from the Blue Ridge Parkway would be blocked by the terrain.

Community Impacts. The "G" alternative would have the least impact on the Blowing Rock Assembly Grounds' operations of any north end alternative that stays south of the Parkway, except Alternative E.

Disadvantages

Visual Impacts. This north end alternative would be within views from the Thunder Hill overlook and within views of the Green Hill Road area from the Blue Ridge Parkway.

Community Impacts. A maximum of 19 homes could be displaced within the Green Hill Road (Craig farm area), Goforth Road, and Opossum Hollow Road communities. As with the previous north end alternative, displacement could be reduced substantially in the Heather Ridge Lane area, but earthwork costs would increase.

Citizens' Advisory Committee and Agency Response

Citizens' Advisory Committee respondents indicated that, although this north end alternative would have less impacts on the Blowing Rock Assembly Grounds than the original A, B, C, and D north end alternatives, it still would have substantial community impacts and therefore was unacceptable. There was more support from agency respondents to this alternative primarily because it would have less of a visual impact on the Blue Ridge Parkway.

7.2.5 "H" Alternative

Location

The "H" alternative would parallel closely the Blue Ridge Parkway and end at US 321 between the Parkway and Moses Cone Park.

Advantages

Traffic. As with the others, this alternative would do well in attracting traffic from existing US 321.

Visual Impacts. Once one leaves the Blue Ridge flank and Craig farm area, views from the Blue Ridge Parkway would be blocked by the terrain. It would not be within views from the Blowing Rock Assembly Grounds lodge.

Community Impacts. This north end alternative would avoid most of the communities south of the Parkway; however, it would pass through the Craig farm area on Green Hill Road and undeveloped portions of the Hillwinds Estates off of Opossum Hollow Road. It would displace only two homes and a restaurant/motel.

Disadvantages

Cost. Of all the north end alternatives, the "H" alternatives would pass through higher terrain with the most regularity, increasing the amount of earthwork and making it the most expensive north end alternative that ends south of the Parkway. For example, the difference in non-tunnel excavation costs between this north end alternative and one that crosses the Parkway is $11.8 million. Steeper grades would reduce the amount of earthwork and the cost of this alternative.

Visual Impacts. This alternative would be within views from the Thunder Hill overlook and within views of the Green Hill Road area from the Blue Ridge Parkway. Parkway officials consider this north end alternative to have the greatest potential for visual impact because if the existing forest were to die, the bypass would be visible clearly from the Parkway for its full length parallel to the Parkway.

Community Impacts. This alternative would pass through the Craig farm area and undeveloped portions of Hillwinds Estates. It would displace a restaurant/motel on US 321. Also, at the Blowing Rock Assembly Grounds, it would use natural areas used by retreat participants and displace a marked trail.

Citizens' Advisory Committee and Agency Response

Only one person among the Citizens' Advisory Committee and agency respondents indicated that this north end alternative should be carried forward to the DEIS. Among the reasons cited for eliminating this alternative from further consideration were high cost and visual impact on the Blue Ridge Parkway. In the past, however, the Concerned Citizens of Blowing Rock have indicated that this was the best location

to end the bypass south of the Parkway.

7.2.6 "I" and "J" Alternatives

Location

These north end alternatives would cross the Parkway in a tunnel and continue north to US 321 at Aho Road.

Advantages

Community Impacts. The "I" and "J" alternatives would pass through only one community, the Thunder Hill Road community. They would avoid completely the communities within Blowing Rock. They also would avoid the Blowing Rock Assembly Grounds.

Disadvantages

Cost. These would be the most expensive north end alternatives because of the tunnel. A tunnel would have a construction cost of approximately $32.3 million for "I" and $35.4 million for "J". The total construction cost for the tunnel alternatives would approach or exceed $100 million. In addition, a tunnel would have on-going operations costs. The National Fire Protective Association Standard 502 specifies a 24-hour-a-day immediate response capability for all new tunnels over 800 feet long. A staff of 23 persons would be needed to meet this specification. Emergency manpower near the tunnel also would be important because of the tunnel's remote location. Lives could be lost if there were a fire in the tunnel and trained people were not on the scene to direct the smoke out of the tunnel properly using the tunnel's mechanical ventilation system, rescue people trapped in the tunnel, and extinguish the fire. In addition, subcontractors would be needed to provide janitorial services in the operations building, computer maintenance, and major repair of tunnel systems. A tunnel shorter than 800 feet cannot be built without encroaching on the Blue Ridge Parkway.

Traffic. A north end alternative that included a tunnel would attract the least amount of traffic from US 321 to the bypass. Only 7,200 vehicles per day would use the bypass in 2025. The other north end alternatives could attract a maximum of 11,000 vehicles per day in 2025. The primary negative effect of this change is that existing US 321 would carry enough traffic to warrant its widening in the Green Park Historic District in 2026. A bypass that ends south of the Parkway could attract enough traffic from US 321 to delay any consideration of widening US 321 in the Historic District until 2040 (assuming current average traffic growth continues beyond 2025).

Visual Impacts. According to Parkway officials, the approach roads associated with a tunnel would have a substantial visual impact on the Parkway. The alternative itself would be visible from the Thunder Hill overlook as it moves along the Blue Ridge Flank.

Community/Natural Resource Impacts. Both of these alternatives would pass through the Thunder Hill community. A trade-off exists between displacement and loss of wetlands. The "I" alternative would displace 21 homes (including a mobile home park with 19 mobile homes) and would avoid wetlands. The "J" alternative would avoid the 21 homes but would displace approximately 3.4 hectares (2.1 acres) of wetlands. This alternative also would pass near some older homes. A survey would be needed to determine their eligibility for the National Register of Historic Places.

Citizens' Advisory Committee and Agency Response

Of the Citizens' Advisory Committee members who responded to the questionnaire and who indicated specific bypass preferences, a majority supported one of these north end alternatives. The Town Council of Blowing Rock has indicated its unanimous support for an alternative that crossed the Parkway in a tunnel. Some other Citizens' Advisory Committee members who did not respond to the questionnaire also strongly advocate crossing the Parkway in a tunnel. They believed that this is the only "true bypass," one that avoids Blowing Rock's residential communities completely. Agency representatives and the Citizens' Advisory Committee members who opposed such a north end alternative cited cost and impact to the Blue Ridge Parkway as primary concerns.

7.3 SUMMARY OF IMPACTS

Starting further south would result in:

- Additional construction period traffic benefits.
- Operational benefits for bypass traffic.
- Reduced operational benefits for traffic remaining on US 321.
- Less displacement.
- Less impact on homes along US 321 and more in rural communities east of US 321.
- Higher cost.
- Higher natural resource impacts.
- Increased potential for Parkway visual impacts.

Any south end alternative except Alternatives E and F would use property from the National Register-eligible Five Points (A.L. Shuford) House.

At the northern end:

- Crossing the Parkway would reduce the effectiveness of the project in attracting traffic from existing US 321.
- Alternatives E and F would have the greatest potential for displacement of homes. Alternative E would be closest to the most heavily developed areas of Blowing Rock.
- Staying close to the Parkway or crossing it would reduce community impacts and displacement (except "I" alternatives), but the project cost would be much higher.

- Alternative E would have the least potential visual effect on the Parkway; the "H" alternatives would have the greatest potential effect.
- Alternatives A, B, C, D, and F would have the greatest impact on the Blowing Rock Assembly Grounds.
- Staying in valleys and steeper grades would reduce the amount of earthwork needed, and, therefore, cost.
- Generally, wetland impacts would be minimal with all alternatives, except for a "J" alternative. (Note: although the area of wetlands affected by the "J" alternative appears small, according to natural resource agency representatives, this is a substantial amount for a mountainous area.)
- National Register-eligible historic resources are in the vicinity of Alternatives E and F but no use of the properties would be required. The other north end alternatives would connect to south end segments that use lands from the Five Points (A.L. Shuford) property.
- Tunnels would cost $32.3 million ("I" alternatives) and $35.4 million ("J" alternatives) plus annual operating costs.

8. CONCLUSIONS

The above analysis and the associated comments from regulatory agencies and the Citizens' Advisory Committee were discussed at two meetings held for the purpose of selecting the bypass alternatives to be evaluated in detail in a Draft Environmental Impact Statement. These meetings were held on January 15, 1997 and March 5, 1997. They were attended by study team representatives of the NCDOT, FHWA, and Parsons Brinckerhoff. No specific procedure or criteria for selecting the alternatives were agreed upon prior to the meetings. In the course of the two meetings the following general selection criteria emerged:

1. The selected bypass alternatives should reflect the diversity of issues and trade-offs associated with the bypass alternatives since no consensus exists on one best bypass alternative between the Citizens' Advisory Committee, citizens in general, the NCDOT and FHWA, the National Park Service, and the environmental and cultural resource regulatory agencies.
2. At least one bypass alternative should be carried forward that does not use Section 4(f) resources.
3. Bypass alternatives opposed by members of the Citizens' Advisory Committee, the Town Council of Blowing Rock, and citizens in general should not be carried forward unless they were considered essential to achieving the first two criteria.
4. At least one alternative should include a tunnel under the Blue Ridge Parkway because of the strong interest in this alternative expressed by many members of the Citizens' Advisory Committee and the Town Council of Blowing Rock.

Alternatives E, CC-CI (includes a tunnel), CC-CH, and a combination of F with the northern ending point used for Alternatives CC-AH, CC-BH, and CC-CH (called FH) were selected for study in greater detail and for comparison to the widening alternative in the Draft Environmental Impact Statement. The bases for these decisions are described in the next two sections.

Alternative FH was not evaluated specifically but considered a possible combination because of its ability to avoid historic resources and the Opossum Hollow Road area. FH would involve six fewer residential displacements than Alternative F, but one more business displacement. The wetland impact is the same as for Alternative F. There is a greater potential for visual impact on the Blue Ridge Parkway; however, the alternative would be obscured by existing trees.

8.1 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATIONSIN THE DEIS

8.1.1 South End Alternatives

The study team eliminated the "A", "CC-A," "B", and "CC-B" alternatives from further consideration because they would involve higher cost, much greater earthwork, greater natural resource impacts, social impacts to the rural communities south of Blowing Rock, and would leave a substantial length of US 321 unimproved. The study team decided that the advantages of these alternatives over other alternatives were not great enough to outweigh the disadvantages. The section of widening between the start of these alternatives and the start of the "C" and "CC-C" alternatives meets the project's design criteria for

horizontal curves. In this same section, the widening project would have only 0.6 miles of grades greater than six percent divided between three locations. The NCDOT can maintain two lanes of traffic virtually all the time during construction of the widening.

The "D" alternative was eliminated from further consideration because it did not address one of the primary concerns of several members of the Citizens' Advisory Committee: it would not bypass an approximately two-mile section of steep grades and sharp curves on existing US 321 as it approaches Blowing Rock.

The "C" and the "CC-C" alternatives are essentially different design variations in the same corridor. The "C" design was eliminated in favor of the "CC-C" design because the "CC-C" design was created to connect to two of the selected north end alternatives and it includes two features favored by several members of the Citizens' Advisory Committee: shallower grades and less displacement on the Blue Ridge Flank.

8.1.2 North End Alternatives

All the alternatives that ended at Opossum Hollow Road except Alternative E were dropped from further consideration because this northern ending point was opposed by most members of the Citizens' Advisory Committee, citizens attending the August 1, 1995 Citizens Informational Workshop, and the Blowing Rock Town Council. The potential impacts of these alternatives to the Blowing Rock Assembly Grounds also were a factor.

The "J" tunnel and design north of the Blue Ridge Parkway also was dropped from further consideration, at least at this time. The differences between the "J" route and the selected "I" route are small. The primary trade-off known at this time is the loss of several acres of wetlands ("J") versus the relocation of 21 homes ("I"). The "J" alternative also passes near several older homes. If the more detailed study of the environmental features that will be conducted during the preparation of the DEIS reveals unforeseen problems, then the "J" route could be revisited.

8.2 ALTERNATIVES SELECTED FOR DETAILED EVALUATION IN THE DEIS

Alternatives E; a combination of F with the northern ending point used for Alternatives CC-AH, CC-BH, and CC-CH (FH); CC-CH; and CC-CI (includes a tunnel) were selected for the following reasons:

- Alternative E (will be referred to as Bypass Alternative 1 in the DEIS)
    - It is the shortest and least expensive bypass alternative.
    - It can be designed to avoid area historic resources.
    - It would have the least visual impact on the Blue Ridge Parkway.
    - It would have a minimal impact on the Blowing Rock Assembly Grounds when compared to the other alternatives ending south of the Blue Ridge Parkway.
- Alternative FH (will be referred to as Bypass Alternative 2 in the DEIS)

    - Like Alternative E, it can be designed to avoid area historic resources.
    - Its northern terminus is between the Blue Ridge Parkway and the northern-most residential subdivision in Blowing Rock, unlike E, which terminates at Opossum Hollow Road. The Blowing Rock Town Council and many members of the Citizens' Advisory Committee have stated their objections to a northern terminus at Opossum Hollow Road.
- Alternative CC-CH (will be referred to as Bypass Alternative 3 in the DEIS)
    - In the past, representatives from the Concerned Citizens of Blowing Rock have indicated that the best corridor for returning a bypass to US 321 south of the Parkway was one that remained as close to the Parkway as possible.
    - It bypasses the final curves on existing US 321 before Blowing Rock, an area where sharp curves and steep grades would remain with the widening alternative. This feature is also important to several citizen representatives.
- Alternative CC-CI (tunnel; will be referred to as Bypass Alternative 4 in the DEIS)
    - It avoids the Town of Blowing Rock by ending north of the Parkway, a feature important to the Town Council of Blowing Rock and many members of the project's Citizens' Advisory Committee.
    - Like CC-CH, it bypasses the final curves on existing US 321 before Blowing Rock, an area where sharp curves and steep grades would remain with the widening alternative.

These alternatives are shown in Figure 10. They were selected for further study and comparison to the widening alternative recognizing that none of the alternatives performs well on all evaluation criteria: cost, engineering, traffic, and environmental (natural and social). Each offers a different set of trade-offs, particularly between cost, social impacts, and natural resource impacts. The support each has from regulatory agencies, the Citizens' Advisory Committee, and citizens in general differs. In addition, citizens and most of the members of the Citizens' Advisory Committee oppose bypass alternatives that end south of the Parkway, with the possible exception of CC-CH. Some of the members of the Citizens' Advisory Committee have expressed the concern that the tunnel associated with the tunnel alternative is too long. Opportunities for reducing the potential for environmental impacts by each alternative and design refinements that might reduce bypass costs will be examined and presented in the DEIS.

In selecting these bypass alternatives for detailed evaluation in the DEIS, the NCDOT and the FHWA also concluded that based on the information known to date, they cannot conclude at this time that any of the bypass alternatives are reasonable alternatives. A decision on the reasonableness, feasibility, and prudence of the widening and bypass alternatives will not be made until after the DEIS has been released and reviewed by citizens and regulatory agencies. This decision, along with the selection of a preferred alternative, will be published in a Final Environmental Impact Statement/Section 4(f) Evaluation and the FHWA's Record of Decision.

9. CITIZEN AND AGENCY INVOLVEMENT

9.1 CITIZEN PARTICIPATION

The Citizen Participation Program is an important component of the US 321 EIS Study. The Citizen Participation Program for the Alternatives Analysis provided interested persons the opportunity to participate in the planning process and understand the overall study process and schedule. Activities during the Alternatives Analysis process included:

- A newsletter that introduced the study, announced the workshop and described the Alternatives Analysis work program.
- Two citizens informational workshops that provided an opportunity for the general public to discuss the study and its findings with members of the study team.
- Citizens' Advisory Committee meetings. This committee was formed to allow citizens of the project area to participate in the planning process and meet regularly with the study team. It consists of 14 members and serves as an advisory body to help the NCDOT develop a project that offers a reasonable balance of the diverse issues associated with the project. The committee consists of representatives from the following government or civic organizations: Blowing Rock Town Council; Watauga County Board of Commissioners; the North Carolina Alliance for Transportation Reform; the Blowing Rock Community Club; the Concerned Citizens of Blowing Rock; the Blowing Rock Chamber of Commerce; the Blowing Rock Merchants Association; the Blowing Rock Historical Society; the Concerned Citizens of Blackberry Valley/Bailey Camp (added in March 1996); the Aho community; the Caldwell County Board of Commissioners; Appalachian State University; and the Blowing Rock Neighborhood Coalition (added in August 1996).
- A toll-free project information line provided direct contact between citizens and the study team.

9.1.1 Newsletters

The first newsletter was issued prior to the citizens informational workshop in August 1995. It informed citizens of the workshop and introduced the study. In addition, it described the Alternatives Analysis work program, the social, economic, and environmental issues that would be examined during the study, and the public involvement program. It was mailed to individuals and organizations on the project mailing list and distributed at the first workshop.

The second newsletter was issued prior to the citizens informational workshop in August 1996. It informed citizens of the workshop and explained the status of the study. It summarized the key engineering, traffic, community and cultural resource, visual, and natural resource findings of the ten potential bypass alternatives. It also explained the public involvement program to date. It was mailed to individuals and organizations on the mailing list and distributed at the subsequent workshop.

9.1.2 Citizens' Advisory Committee

July 12, 1995 Meeting

The purpose of this meeting was to review the role of the Citizens' Advisory Committee, to elect a committee chairperson, and to describe the project's history, its current status and the scope of work for the Environmental Impact Statement. The group also discussed the types of issues to be addressed when comparing bypass alternatives. Specific concerns raised by committee members included:

- The environmental and community impacts associated with a bypass would be greater than those associated with the widening.
- Countywide impacts, rather than only impacts to Blowing Rock, need to be assessed.
- Safety should be the overriding factor when choosing a bypass or widening alternative.
- Widening the road would have adverse impacts on the Green Park Historic District.
- A bypass will be necessary even if the existing road is widened.

The Committee also requested that a copy of accident records for the area be sent to members.

November 11, 1995 Meeting

The committee reviewed comments from the workshop and from agency scoping letters. Another topic was how to avoid sensitive features when selecting a bypass alternative. The majority of the time was spent on basic design concepts, potential location corridors and typical section alternatives for the potential bypass alternatives. Specific questions and concerns expressed by committee members included:

- What is the National Park Service's reaction to a Parkway crossing?
- Will the Federal Emergency Management Agency (FEMA) be involved in the study?
- Why was a 1993 estimate of displacements associated with the widening different from a 1991 estimate?
- Should the taxpayers of Blowing Rock expect a tax increase to fund the relocation of utilities?

There were several questions about grades on the bypass and the cost of certain features like truck escape ramps. One member also asked that the study team explore a tunnel option in more detail. The Committee expressed an interest in seeing the alternatives on a topographic map. Finally, one committee member was concerned that members were not getting an equal amount of time to ask questions and, therefore, the responses of the study team seemed to be one-sided.

March 27, 1996 Meeting

The focus of this meeting was traffic and accident studies. Study team members presented traffic forecasts and level of service and accident analyses for existing US 321 and for the potential bypass alternatives. The committee and study team also discussed the engineering tradeoffs associated with the bypass alternatives that had been developed at that point. Questions were raised about...

- the traffic model. Many questioned the accuracy of the model as well as the accuracy of the data put into the model.
- the 30th highest hourly volume.
- the accident analysis. The committee wanted to know if it accounted for the higher speed of a four-lane road. Another member asked why there were more total accidents with the bypass than with the widening alternative. Comments were made regarding the severity of accidents.
- whether or not truckers would remain on the existing route to avoid the grades on the bypass.
- the alternatives. Some committee members were concerned about community impacts in the Opossum Hollow Road area, while others were concerned about the environmental and community impacts in the Blackberry Valley/Bailey Camp area. A majority of the questions and comments, however, were engineering-related (grades, bridges, costs, etc.)

July 31, 1996 Meeting

The purpose of this meeting was to present the ten initial potential bypass alternatives to the committee and to explain the criteria used to identify them. Similarities and small differences among the alternatives also were presented to the committee. Committee members were asked to identify the factors they considered most important in selecting bypass alternatives and to choose the alternatives, of the ten presented, that should be evaluated in the DEIS and compared to the widening alternative. The factors selected most important by committee members, in order, were community impact, safety, efficiency of traffic movement, and cost. The majority of the members stated that none of the alternatives were acceptable either because they preferred the widening alternative or because they favored an alternative that completely bypassed Blowing Rock or crossed the Blue Ridge Parkway. The NCDOT reaffirmed its decision not to pursue bypass alternatives that cross the Blue Ridge Parkway. Specific comments by committee members included:

- Each of the alignments is fatally flawed. It was stated that refinements to the alignments submitted by the Concerned Citizens of Blowing Rock (A, B, C, and D) had rendered them unacceptable because of steeper grades and greater community impacts.
- The NCDOT has not made a good faith effort to comply with Section 4(f) of the National Transportation Act of 1966 in its identification of bypass alternatives.
- None of the alignments meet the criteria for a safe highway. The study team assumed this comment referred to the grades of the potential bypass alternatives.
- What are the Blue Ridge Parkway restrictions?
- The corridors do not bypass Blowing Rock enough. Some committee members want an alignment that completely avoids the town limits of Blowing Rock.
- The information presented shows conclusively that a bypass is not a feasible alternative and that widening the existing road is the only practical solution. This view was shared by a few of the committee members who believed that engineering and environmental findings demonstrated that a bypass would not be feasible in this area.
- Although the widening alternative is preferred, E is the best of the alignments being examined. This view was expressed by a committee member who, although he preferred the widening alternative, was able to select the alignment he thought should be in the Draft Environmental

Impact Statement for comparison to the widening alternative.

Other committee members elected to mail their comments to the study team. Of the comments received, half expressed a preference for widening the existing road.

At the urging of the Blowing Rock Town Council, the Concerned Citizens of Blowing Rock, and citizen comment, the study team decided after this meeting and the second Citizens Informational Workshop to examine several new alternatives proposed by the Concerned Citizens of Blowing Rock, including a tunnel under the Blue Ridge Parkway. The Concerned Citizens provided maps showing its preferred bypass locations and design parameters. The study team met with representatives of the Concerned Citizens of Blowing Rock prior to completing its designs to affirm that the designs met the Concerned Citizens' expectations. The only expectation not met was tunnel length. The Citizens' Advisory Committee was given the opportunity to respond to a questionnaire that asked for comments on which bypass alternatives should be carried forward for detailed evaluation in the DEIS. Questionnaire results are discussed below in section 9.3.

June 24, 1997 Meeting

At this meeting, the NCDOT presented the four bypass alternatives that would be evaluated in detail and compared to the widening alternative in the DEIS. The new Transportation Board member for Division 11 was present and offered comments. A representative of the FHWA regional office in Atlanta also attended to discuss Section 4(f) requirements. Committee members continued to express concern over community impact, particularly with the non-tunnel bypass alternatives. Questions and comments included:

- What is the anticipated schedule for completion of the DEIS?
- Cost should not be a factor in building a good highway.
- There is considerable concern that if existing US 321 is widened, traffic will be diverted through downtown, which would be detrimental to businesses and the downtown character.
- Residents of Green Hill and along Green Hill Road do not support a bypass near or through that area.
- How reliable are the cost estimates?
- Why was the "H" alternative selected when, according to the questionnaire responses, only one person supported it?

9.1.3 Citizens Informational Workshops

Two citizens informational workshops were held. The first was held on August 29, 1995 at the Blowing Rock School Cafeteria. The second workshop was held on August 1, 1996. At both workshops, the agenda was informal. The public was invited to come at any time during a three-hour period to see the land suitability map, the potential bypass alternatives (at the second workshop), ask questions, and give comments to study team members.

August 1995 Workshop

On August 29, 1995, 194 persons registered their presence. Key issues raised related to:

- Support for a Blowing Rock bypass. Supporters said they believed that widening US 321 would...
    - spoil the character of Blowing Rock;
    - adversely affect the historic district;
    - close businesses along US 321 during construction;
    - encourage unsafe speeds and cause more accidents;
    - cause structural damage during blasting;
    - jeopardize the safety of students who cross US 321 walking to and from school;
    - increase truck traffic in Blowing Rock;
    - increase crime in Blowing Rock; and
    - become obsolete in a few years, necessitating a bypass anyway.
- Support for widening US 321. Supporters believed that a Blowing Rock bypass would...
    - displace more people than the widening alternative;
    - adversely affect the area's natural beauty;
    - adversely affect the natural environment;
    - cost much more than the widening;
    - increase noise levels;
    - spoil views, thereby reducing property values; and
    - spoil views and serenity from Parkway overlooks.
- Development of alternatives.
- Land suitability map.

August 1996 Workshop

On August 1, 1996 239 persons registered their presence. Information was organized into five sets of displays, each staffed by a study team member(s) with expertise in that particular topic. The topics included:

- Criteria for identifying potential bypass alternatives.
- Engineering findings.
- Community and cultural resource findings.
- Natural resource findings.
- Next steps.

Written comments received during and after the workshop can be summarized in the following way:

- Those who favor a bypass and accepted the work done by the study team.
- Those who favor a bypass but considered the potential bypass alternatives unacceptable for various reasons.
- Those who favor widening the existing road.
- Those who prefer a "Do Nothing" alternative.
- Those who were unhappy with the workshop format.

As noted above, at the urging of the Blowing Rock Town Council, the Concerned Citizens of Blowing Rock, and citizen comment, the study team examined several new alternatives following the second workshop, including two that included a tunnel under the Blue Ridge Parkway.

9.1.4 Toll-Free Project Information Line

During the alternatives study, several calls were received on the information line. Many people called to be placed on the mailing list and several others had questions and comments about the location of potential bypass alternatives. Several were concerned with how a particular corridor(s) would affect their homes.

9.2 INTERAGENCY COORDINATION

In August 1995, a scoping letter was distributed to regulatory agencies to solicit comments for the EIS study, initiate coordination for the project and provide notice of an interagency scoping meeting, held on February 1, 1996. A second interagency meeting was held on December 17, 1996.

9.2.1 February 1, 1996 Meeting

A meeting was held with representatives of federal and state regulatory agencies on February 1, 1996. Agencies represented included:

- Caldwell County
- Town of Blowing Rock
- Federal Highway Administration
- NC Department of Cultural Resources
- NC Department of Environment, Health and Natural Resources
    - Division of Environmental Management
    - Wildlife Resources Commission
- NC Forest Service
- US Army Corps of Engineers
- US Fish and Wildlife Service

After discussing the progress of the project since the last Steering Committee meeting in 1991, the study

team presented its findings related to:

- Potential bypass alternatives and their origin
- Traffic forecast observations
- Level of service results
- Capacity sensitive analysis
- Accident analysis
- Median safety study

The presentation also included a discussion on observations about the bypass alternatives, the merits of crossing the Parkway in a tunnel and recommendations for the rest of the study.

9.2.2 December 17, 1996 Meeting

A second interagency/steering committee meeting was held on December 17, 1996. Agencies and organizations represented included:

- Town of Blowing Rock
- Watauga County
- Region D Council of Governments
- Concerned Citizens of Blowing Rock
- Blowing Rock Historical Society
- NC Alliance for Transportation Reform
- Appalachian State University
- US Fish and Wildlife Service
- Federal Highway Administration
- Blue Ridge Parkway
- NC Department of Cultural Resources (SHPO)
- NCDEHNR - Division of Water Quality
- NC Wildlife Resources Commission

The primary purpose of this meeting was to present the additional citizen alternatives and a preliminary evaluation for all of the alternatives. After the meeting a questionnaire was prepared to aid regulatory agency and local government representatives in identifying the bypass alternatives they thought should be evaluated in detail in the DEIS. (See section 9.3 below.)

9.3 ALTERNATIVES ASSESSMENT QUESTIONNAIRE

At the second interagency meeting, it was suggested that the information about each alternative be compiled to reflect that the various corridors could be mixed and matched. This was done in the form of a questionnaire, which was sent to agency representatives, representatives of various NCDOT branches, and the Citizens' Advisory Committee. In the questionnaire, the potential bypass alternatives were

divided into two geographic areas: south end alternatives and north end alternatives. In each geographic area, advantages and disadvantages were described for each alternative. For each question, respondents were asked to answer "yes" or "no", and give their reasons. The questionnaires were mailed in late January and early February. Sections 7.1 and 7.2 present the alternatives and the advantages and disadvantages of each alternative as they were presented in the questionnaire.

Eighteen responses were received, 10 from the Citizens' Advisory Committee and 8 from regulatory agencies. These comments are summarized in section 0 under "Citizens Advisory Committee and Agency Response" and in Table 12. In general, the members of the Citizens' Advisory Committee were opposed to the longer bypass alternatives ("A", "CC-A", "B", and "CC-B" alternatives) and to a northern terminus at Opossum Hollow Road. Three of the Citizens' Advisory Committee respondents were not in favor of a bypass at all. Of those who responded, the most support was for an alternative that started north of the "S" curves but south of the sharp curves ("C" and "CC-C" alternatives) and ended in a tunnel. There was no agency support for an alternative that started south of the "S" curves or ended in a tunnel (although one respondent suggested that a tunnel be studied since it was the preferred alternative of the Concerned Citizens of Blowing Rock and the Blowing Rock Town Council. Two of the agency respondents did not favor a bypass at all. Of those who selected alternatives to be studied further, most preferred Alternatives D, E, and F. Several respondents chose to make general remarks in letters and not respond directly to the questions.

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APPENDIX A

ASSESSMENT OF INITIAL BYPASS CORRIDOR ALTERNATIVES

Engineering, traffic, social, cultural resource and natural resource considerations were taken into account in comparing the potential corridor alternatives. In order to compare corridor alternatives from common starting and ending points, the widening segment for each corridor also was considered. For example, corridors A and AG are all bypass and no widening since they begin at the southern end of the project area, whereas the other corridors consist of widening from the southern end of the project area up to the point where the bypass leaves US 321. Therefore, when evaluating factors associated with each corridor alternative, the bypass segment as well as the widening section are considered cumulatively.

The factors considered in comparing the alternatives were:

1. Engineering considerations

    a. Length
    b. Cost
    c. Excavation
    d. Grades
    e. Horizontal curves
    f. Bridges
    g. Relation to existing roads

2. Traffic considerations

    a. Average daily traffic
    b. Level of service

3. Social considerations

    a. Displacement
    b. Community cohesion
    c. Public recreation lands affected
    d. Farmlands
    e. Noise impact potential
    f. Hazardous materials and underground storage tanks

4. Natural resource considerations

    a. Biotic communities
    b. Rare and unique natural areas

c. Habitat fragmentation
d. Terrain changes
e. Highly erodible soils
f. Section 404 jurisdictional areas
g. Protected and rare specie

5. Historic resource considerations

a. National Register-listed properties
b. National Register-eligible properties

6. Visual resource considerations

a. Changes in high quality views
b. Other views it alternatives

A1.1 ENGINEERING CONSIDERATIONS

Construction and right-of-way cost, length, amount of excavation, grades, horizontal curves, number of bridges, and intersections are presented in Table A-1 for each corridor alternative.

A1.1.1 Length

The total length for each corridor alternative is the length of the bypass plus the length of the widening segment. The widening segment is the distance between the southern end of the project area and the southern terminus of the bypass. The total length would not vary much among alternatives since they all would start and end at the same points. The difference between the longest corridor (AG) and the shortest (C) is only 0.3 kilometer (1.2 miles).

A1.1.2 Cost

Corridors that include a bypass that would leave existing US 321 near the southern town limits of Blowing Rock (D, DG, E, and F) would have lower construction costs than corridors whose bypass portion begins further south (A, AG.B, BG. C, and CG). This finding is reflected in the cost per unit of distance. Corridors C, CG, D, and DG would have lower right-of-way costs than corridors E and F. Right-of-way costs were not prepared for A, AG, B, and BG for reasons footnoted on Table A-1. Right-of-way costs for A, AG, B, and BG would be at least as much as C and CG because most of the C and CG bypass portions follow the same alignment as corridors A, AG, B, and BG. When right-of-way costs are added to construction costs, Alternative E would be the least costly alternative with CG, D, DG, and F ranging from $5 million to $8.6 million higher than E. Alternative C would be $10.6 million higher in cost than E.

A1.1.3 Excavation

An important consideration when selecting bypass corridor alternatives is the amount of earthwork that would be required to construct a road in a particular corridor. The more excavation involved, the higher the construction cost of that corridor. Corridors with bypass segments that leave existing US 321 near the southern town limits of Blowing Rock would involve less excavation than those whose bypass portion begins further south.

A1.1.4 Grades

The length of corridor with grades greater than or equal to six percent tends to be of the same order of magnitude for most of the alternatives. D, DG and F would have the least amount of grade greater than or equal to six percent. For grades greater than seven percent, corridors AG, BG,CG, DG, and F would have shorter lengths of these steep grades than their counterparts A,B,C,D, and E. Corridors C, CG and D would have the least length of grades greater than seven percent. Grades greater than seven percent could be reduced on their bypass segments by design changes. The resulting road would not follow the existing terrain as closely, however, increasing the height of cuts and fills and disturbance to the natural areas and communities. This trade-off could be considered further for alternatives carried forward into the Environmental Impact Statement.

A1.1.5 Horizontal Curves

Corridors whose bypass portion starts near the Blowing Rock Town Limits (D,DG, E, and F) would have several horizontal curves that do not meet the project's design criteria. All of the deficient curves are associated with the widening portion of the corridors.

A1.1.6 Bridges

Corridors D and DG would contain the most bridges, with five, because of their positioning on the side of a ridge. Corridor E would contain the fewest number of bridges, with only one.

A1.1.7 Relation to Existing Roads

The number of intersections would vary by alternative and would depend on whether the terrain would allow the bypass to cross each existing road at grade. All of the alternatives would pass under Green Hill Road. There would be no connection between Green Hill Road and the bypass. All alternatives would include intersections would include intersections with Forest Lane and Opossum Hollow Road.

A1.2 TRAFFIC CONSIDERATIONS

Forecast traffic volumes and level of service for US 321 within the project area and the Bypass Alternative are presented in Table A-2 for each corridor alternative.

In general the following traffic observations can be made about the Bypass Alternative:

- The farther south the bypass starts, the longer the segment of US 321 that would continue to have an undesirable level of service. This condition would occur because there would be a greater distance (equal to the length between the southern end of the bypass and Green Hill Road) that would remain unimproved. Therefore...

    a. Congestion would occur on any remaining two-lane section of US 321 south of Blowing Rock because of steep grades.
    b. High accident rates would remain where no improvements were made on existing US 321.

- There would be less use of a bypass by local traffic if the bypass route were longer than the existing route (as with corridors D and DG). If the bypass were shorter than the existing route, more local residents would use it to get to the commercial area on US 321 and to downtown.
- Acceptable traffic flow would occur on the bypass and on existing US 321 within Blowing Rock with any bypass corridor alternative. With a bypass, peak hour congestion would begin to occur in about the year 2020 on existing US 321 north of Sunset Drive.

A1.3 SOCIAL CONSIDERATIONS

Except for Blackberry Valley/Bailey Camp and Green Hill, neighborhood boundaries are not clearly defined within the project area. Thus, concentrations of development that could be affected by the corridor alternatives are the focal point for social considerations. These areas include Blackberry Valley/Bailey Camp, Green Hill/Green Hill Road, Wonderland Drive, Assembly Grounds, and Opossum Hollow Road. Displacement effects on community cohesion, noise, visual effects, and hazardous materials and underground storage tank sites are discussed in this section and are summarized in Table A-3.

A1.3.1 Displacement

Displacement estimates for all corridor alternatives are similar, ranging from 29 with D to 35 with F. Corridor F would include the most displacements in the Green Hill/Green Hill Road area as it follows the ridge line and displaces many of the homes along the ridge. Estimates were not prepared for corridors A, AG, B, and BG because other engineering, traffic and environmental findings seemed to indicate that these alternatives did not possess substantial advantages over the other potential alternatives. It can be inferred, however, that in the Watauga County portion of the project area, displacements for these corridors would be similar to C, CG, D, and DG since the alignments are similar. Also, it can be inferred that in the Caldwell County portion of the project area, displacements would be low, especially for A and AG, because of the lack of widening and because they pass through primarily undeveloped areas.

A1.3.2 Community Cohesion

The introduction of a new road in the middle of a single community or neighborhood can affect community cohesion. A new road can create a physical barrier or a psychological barrier. An elevated or access-controlled road can create a physical barrier to pedestrian and bicycle movement along informal routes. An elevated road can create a psychological barrier by blocking views from one part of a community to another. A road with at-grade intersections and carrying traffic volumes that are greater than those currently experienced in the community can inconvenience local traffic. It also can reduce the safety of pedestrians and bicycles traveling from one side of the community to another.

The effects of each corridor alternative on community cohesion in the above-listed areas of development are discussed below and are summarized in Table A-3.

Blackberry Valley/Bailey Camp Area

In general, effects on communities in Caldwell County would be less with corridors D, DG, E, and F. All corridors would follow ridges in this area and avoid valley communities. The most substantial impacts would occur with corridors A, AG, B, and BG. A and AG would cross Blackberry Road, relocating Bailey Camp Baptist Church and its cemetery. B and BG would form an intersection with Bolick Road and Blackberry Road, separating St. Mark's Lutheran Church on US 321 from the rest of the Bailey Camp community.

Green Hill/Green Hill Road Area

This area would be affected by all of the corridor alternatives, although with varying degrees of severity. All of the crossings would pass under Green Hill Road and not intersect with it. Corridors A, AG, B, BG, C, CG, D, and DG would be below the homes lining the ridge in Green Hill. These corridors would displace some homes north of Green Hill and would bisect the farming community, including a farm, at the northern end of Green Hill Road. Corridor E would cross Green Hill Road just north of Green Hill roughly at subdivision boundaries. Corridor F would displace several homes along the ridge and also would displace some homes just north of Green Hill where it crosses Green Hill Road at a location similar to Corridor E.

Wonderland Drive Area

This area is avoided by all of the corridor alternatives, except E and F, which cross Green Hill Road just north of Green Hill. Corridor E would cross at-grade along the edge of a neighborhood on Wonderland Woods Drive and adjacent to the golf course. Corridor F would separate the Wonderland Drive subdivision from the homes along Green Hill Road. The crossing formed by corridor F and Wonderland Drive would be grade-separated.

Assembly Grounds Area

A bypass between the Assembly Grounds buildings and the Parkway (A, B, C, D, and F) would have

greater impacts on the activities at the Assembly Grounds than other bypass corridors. A, B, C, D, and F would pass north of the Assembly Grounds main buildings through a natural area used for retreats. These corridors would displace a marked nature trail (the blue trail) and would pass adjacent to an open space used for recreation activities. The main entrance to the Assembly Grounds would be altered. E would pass south of the Assembly Grounds buildings, intersecting with Goforth Road near the service entrance to the Assembly Grounds. Lands used from the Assembly Grounds would be limited. Alternatives AG, BG, CG, and DG would use land from the south side of the Assembly Grounds property but generally would avoid primary activity areas. As with E, the service entrance would be altered.

Opossum Hollow Road

All of the corridor alternatives end with an intersection at Opossum Hollow Road. Through traffic would be introduced to this area.

A1.3.3 Public Recreation Lands Affected

None of the corridors would affect public recreation lands. In addition, none of the alternatives would use lands from the private Blowing Rock Country Club.

A1.3.4 Farmlands

Corridor E would use the most prime farmland, 2.2 hectares (5.3 acres), while corridor F would use the least, 0.7 hectares (1.7 acres). The other corridor alternatives would use less than 2.0 hectares (0.8 acres) of prime farmland.

A1.3.5 Noise Impact Potential

Only one to three houses would be within 40 meters (131.1 feet) of the travel lanes with the bypass portion of any of the corridors. Few homes would be in proximity to the travel lanes because of the corridor's wide cuts and fills. The travel lanes of they bypass portion of corridors AG, B, CG, and DG would be within 40 meters (131.1 feet) of the First Independent Baptist Church on Opossum Hollow Road. The travel lanes of corridors A, B, C, D, and F would be within 40 meters (131.1 feet) of an Assembly Grounds' recreational open area. The potential for noise impact would be greater for those corridors with more widening and less bypass since sensitive uses would remain along US 321 after a widening is completed.

A1.3.6 Hazardous Materials and Underground Storage Tanks

There are no known hazardous material spill sites adjacent to any of the corridors. One potential underground storage tank site is adjacent to the bypass portion of B and BG and one is adjacent to the widening portion of all the corridors except A, AG, B, and BG.

A1.4 NATURAL RESOURCE CONSIDERATIONS

A1.4.1 Biotic Communities

Table A-4 shows the approximate area of impact to each community within the ten initial corridor alternatives. Cove forest is the only natural community identified within the project area and is easily the dominant community throughout the project area, accounting for a portion of the total area of corridors ranging from 69 to 83 percent. Longer corridors (such as the variations of A, B and C) would tend to extend farther from the existing US 321 where little development has occurred. These alternatives would include more of he undisturbed cove forest and less of the development-oriented communities (pastoral/agricultural land, plantation/orchard land, and residential/disturbed land) than shorter alternatives (variations of D, E and F), which are planned for routes closer to existing roads and residential areas. Most of the impacts to developed areas would occur in the region above the Blue Ridge flank in the vicinity of Blowing Rock. AG, BG, CG, and DG would have slightly increased impacts on developed areas and decreased impacts on cove forest.

A1.4.2 Habitat Fragmentation

Wildlife in the vicinity of Blowing Rock and its associated development has adapted to the presence of anthropogenic disturbances and, therefore, is not expected to be adversely affected by construction of a bypass. On the Blue Ridge flank, however, development is relatively scarce and isolated, and construction of a new road in this region would have a substantial impact on natural habitats in terms of forest fragmentation, conversion of interior forest to ecotone (edge habitat, or a transition zone between two or more habitats), and interruption of wildlife transportation corridors.

Some species of wildlife, most notably black bear (*Ursus americana*) and certain migratory songbirds, prefer interior, unfragmented forest habitats. Such species may react to fragmentation by abandoning the area; right-of-way corridors may become vectors for competitors, predators or parasites. Planning alignments close to existing developed areas and with minimum lengths through natural areas would reduce adverse impacts to local wildlife.

In most of the cove forest the terrain is so severe that ground-dwelling wildlife would tend to utilize stream bottoms and ridge lines as travel corridors. Since wildlife movements can be expected to occur primarily parallel to the existing stream and ridge orientation, alignments that are planned perpendicular to this direction would provide more imposing transportation barriers. Again, planning alignments close to existing developed areas would minimize detrimental effects on local wildlife.

A1.4.3 Terrain Changes

Terrain changes needed to construct a road may include filling valleys and cutting ridges and side slopes. The relative amount of terrain changes required by each corridor can be inferred from the area included in the plan view footprint; the wider the footprint, the more cutting or filling required to construct the

facility. Corridors with narrower average widths should have less of an impact on the existing terrain. Average widths between the construction limits of each corridor are presented in Table A-4. A comparison among corridors indicates that E and CG might require somewhat less than average earthwork along a given length while A and AG may require somewhat more than average earthwork along a given length.

A1.4.4 Highly Erodible Soils

The approximate linear distance that each corridor extends through area characterized by highly erodible soils is given in Table A-4. The length that a corridor extends through the Blue Ridge flank would be related directly to the amount of highly erodible soils that may be affected by that corridor. Corridors A, AG, B, and BG would include greater linear distances through these soils, while corridors E and F would include less linear distances through highly erodible soils.

A1.4.5 Section 404 Jurisdictional Areas

Table A-4 shows the approximate area of impact to jurisdictional areas within each of the ten initial corridors. Jurisdictional area impacts are displayed as bank-to-bank streams, ponds and wetlands. Of these jurisdictional areas, wetlands are considered to provide the highest variety of environmental functions, and wetlands are considered to be more difficult to replace than bank-to-bank systems and ponds. Bogs provide wetland functions such as toxicant retention, production export, flood-flow alteration, and vegetative cover for wetland-dependent species such as frogs and salamanders.

The corridors with longer bypass segments (A, AG, B, BG, C, and CG) would cross greater numbers of bank-to-bank streams than those with shorter bypass segments, but impact areas would be relatively similar among all corridors because of the small widths of these streams. CG would cross the most streams (ten), while E would cross the fewest (three).

Four streams within the Yadkin-Pee Dee Basin would be affected by the corridor alternatives. The upper end of Martin Branch would be crossed by all corridors. Bailey Camp Creek would be crossed by corridors A, AG, B, BG,C, and CG. Ooten Creek and Jackson Camp Creek would be crossed by corridors A and AG only. These crossing all would be nearly perpendicular.

Two streams within the New River Basin would be affected by the corridor alternatives. Middle Fork would be crossed by each corridor in the headwaters above the golf course. Crossings of this stream would be nearly perpendicular. An unnamed tributary to the Middle Fork flows adjacent to Opossum Hollow Road just below Chetola Lake. The stream would not be crossed, but the corridors would parallel its east bank for varying distances. All stream crossings are important because of potential impacts on water quality and subsequent concerns for aquatic species.

Only one open water pond would be affected by any of the alternatives. Corridor C would cross it near the headwaters of Bailey Camp Creek.

A single pocket of wetlands is adjacent to Middle Fork immediately above the golf course west of Blowing Rock. This wetland system varies in width with the meandering of Middle Fork and reaches a maximum width of approximately 52 meters (170 feet). The wetland area is disturbed on one side by a maintained utility line right-of-way. This system is limited in length by a maintained pasture upstream and a golf course and utility line downstream. This wetland system would be crossed by corridors E and F.

A1.4.6 Protected and Rare Species

No preferred habitat is believed to exist within the project area for any of the five species currently listed for federal protection within Caldwell and Watauga Counties. The preferred habitat of the bog turtle (proposed for listing as protected) occurs within the project area (bog wetlands associated with the stream adjacent to Wonderland Drive, crossed by Alternatives E and F); however, the bog turtle has not been documented from the project area. No documented unique plant communities or federally protected plant or animal species are expected to be affected by any of the alternatives.

The May 2, 1997 USFWS list also includes a category of species designated as Federal Species of Concern (FSC). The FSC designation provides no federal protection for the species listed. There are 13 species with this designation listed for Caldwell County and 17 species with this designation listed for Watauga County. No FSC-designated species have been documented within the project area according to Natural Heritage Program (NHP) records (July, 1997).

Of the three state-protected species that have been documented in the vicinity of the project area, none are known to occur within the project area, and none were observed during project area visits. Typical habitat of Queen-of-the-prairie and Grey's lily consists of bogs and wet meadows, habitats that only would be affected by alternatives E and F. The Allegheny woodrat prefers rocky slopes and outcrops in hardwood and mixed conifer-hardwood forests. This habitat is in abundance throughout the region.

A1.5 HISTORIC RESOURCE CONSIDERATIONS

As shown in Table A-5, none of the corridors would affect the National Register-listed Green Park Historic District, the Green Park Inn, or the Bollinger-Hartley House. Every alternative, except E and F, would pass through the property containing the National Register-eligible Five Points (A.L. Shuford) House. The property extends down the Blue Ridge flank to about 3,200 feet in elevation The bypass would be below the home with all but Alternatives E and F. Alternatives E and F are both close to the Five Points (A.L. Shuford) House. E also is close to the Young-Shaw-Steele house, a property eligible for the National Register as an extension of the Green Park Historic District. Both alternatives, however, can be designed to avoid the properties.

A1.6 VISUAL CONSIDERATIONS

The impact of the various bypass corridor alternatives on areas with high quality views is discussed in Table A-6.

A1.6.1 Green Hill/Green Hill Road Area

With all corridor alternatives, as the bypass approached the top of the Blue Ridge flank, it would become visible from the Green Hill/Green Hill Road area in the foreground of views of the Blackberry Valley/Bailey Camp area. At lower points on the Blue Ridge flank, views probably would be blocked by vegetation. The bypass would be visible in distant views of the Blackberry Valley/Bailey Camp area with corridors A, AG, B, and BG.

A1.6.2 Blowing Rock Assembly Grounds Area

For corridors A, B, C, D, and F, the bypass in cut would replace current forest views from the north side of the Assembly Grounds' lodge and dormitories.

A1.6.3 Blue Ridge Parkway

With all corridors except E and F, the bypass would be clearly within views from the Blue Ridge Parkway's Thunder Hill overlook, particularly as it moved around Locus Ridge and began to approach the Parkway. The bypass would be within views of Parkway users as it passed through farmland on Green Hill Road. For corridors E and F, the bypass would be present in distant views from the Parkway's Thunder Hill overlook. Alternative A would be the most visible as it follows the top of a ridge before reaching the Blue Ridge Flank.

A1.6.4 Other Neighborhoods Within Project Area

The bypass would be added to views in the project area communities through which it passes. Viewers would see the road, the cuts and fills associated with the road, and traffic on the road. This would represent a substantial change from the views of trees, open fields, lawns, and narrow two-lane roads that make up current views.